**ABSTRACT**

Self-monitoring of blood glucose (SMBG) can be an important tool in diabetes treatment, both for patient self-management and for guiding clinicians regarding medication adjustments. Evidence supports the association of SMBG with clinical outcomes in patients with type-1 diabetes mellitus (T1DM) although it is mixed for patients with type-2 diabetes mellitus (T2DM). The cost of SMBG comprises a substantial portion of the total cost for patients with diabetes, and test strips are one of the main expenditures of the University of North Carolina Medical Center Pharmacy Assistance Program (PAP), which provides medication coverage, including test strips, to indigent patients who have no pharmacy insurance. The objective of this study is to evaluate the utility of SMBG based on the impact of test-strip adherence on glycemic goal attainment in an indigent population that is provided with low-copay test strips.

This retrospective cohort study included patients with T1DM or T2DM who were enrolled in PAP in 2016 and who received a prescription for test strips during the 90 days prior to hemoglobin A1c (HbA1c) measurement. Adherence was defined as the proportion of days covered (PDC) ≥ 0.8. Of the 498 patients encountered, 20% of the adherent group (n = 245) and 25% of the nonadherent group (n = 253) had a goal of HbA1c < 7% (P = 0.24). There were no differences in mean HbA1c between the groups, except in the multiple daily injections (MDI) of the insulin subgroup (8.9% vs. 9.6%, P = 0.009). The adherent group was 80% less likely to have a diabetes-related hospitalization (odds ratio [OR], 0.2; 95% CI, 0.04–0.92). The total test-strip cost to PAP was more than $200,000. In conclusion, in an indigent population, adherence to SMBG does not correlate with glycemic goal attainment and imposes a substantial cost burden on the healthcare system.

**Keywords:** Self-monitoring of blood glucose (SMBG), adherence, indigent population, formulary management, cost savings, diabetes mellitus

**INTRODUCTION**

The self-monitoring of blood glucose (SMBG) is an important tool in diabetes treatment for improving patient self-management and guiding clinicians in adjusting medications. Also, SMBG comprises a substantial portion of the total expenditure involved for patients who have diabetes. It is estimated that blood-glucose meters and test strips account for at least two-thirds of the diabetes technology market. A study looking at all SMBG and insulin-related expenditures found that SMBG constituted 21% to 35.8% of the cost, depending on the type of insulin regimen. The mean annual cost of SMBG was $772 per person. Another study found that the incremental increased cost of low-intensity or high-intensity SMBG per quality-adjusted life year (QALY), in patients with non–insulin-treated diabetes, had a negative impact on quality of life compared to the standard of care. Several studies have demonstrated cost savings without significant impact on HbA1c when restricting test-strip quantity for patients with non–insulin-treated type-2 diabetes mellitus (T2DM).

SMBG data can be used to improve glycemic control and to identify hypoglycemic events and persistent hyperglycemia. Patients can obtain direct feedback on how diet, exercise, and medications affect their blood glucose and use that information to adjust their lifestyle choices. The clinical utility of SMBG is dependent upon patients understanding the proper technique, being adherent to testing, and correctly interpreting the results. In addition, clinical utility comes from patients sharing their testing results with providers, and providers acting on that data to make treatment decisions.

The benefit of SMBG in patients who have T1DM has been demonstrated in several studies. The American Association of Clinical Endocrinologists/American College of Endocrinology (AACE/ACE) 2016 Outpatient Glucose Monitoring Consensus Statement recommends frequent SMBG, and the American Diabetes Association (ADA) 2019 Standards of Care state that frequent testing of blood sugars (≥ 6–10 times per day) is often needed for people with intensive insulin regimens. The evidence supporting SMBG effectiveness is strong in patients with T1DM and in patients with T2DM who are treated with insulin. Frequent SMBG has been associated with a lower HbA1c in patients who have T1DM. For patients who have T2DM and are taking insulin, testing blood glucose more than once daily was also associated with improved HbA1c.

The evidence is less clear for patients with T2DM, particularly for those treated without insulin. Several trials have shown no added benefit in non–insulin-treated patients using SMBG. In a prospective, randomized controlled trial of 184 patients newly diagnosed with T2DM and not receiving insulin, there was no difference in HbA1c between the groups after 12 months. A meta-analysis of randomized controlled trials found a small but statistically significant decrease in HbA1c among non–insulin-treated patients with T2DM using SMBG.
SMBG at six months, which then subsided at 12 months. A prospective trial of patients with T2DM who were randomized to no SMBG, standard once-daily SMBG, or enhanced once-daily SMBG with automated messages delivered to patients via their meter, found no clinical or statistical difference in HbA1c levels or health-related quality of life over one year among the three testing strategies. On the other hand, two other meta-analyses incorporating more recent data did show small yet statistically significant and sustained improvements in HbA1c over one year. In their Choosing Wisely initiative, the Endocrine Society recommends avoiding routine SMBG in patients with T2DM who are taking agents that do not cause hypoglycemia. Although the ADA doesn’t recommend when or how often to prescribe SMBG for patients taking basal insulin or those with oral regimens, it suggests that routine SMBG may have limited clinical benefit and that its prescription should always be accompanied by education and the monitoring of technique.

In addition to diabetes type and medication regimen, other factors can affect SMBG utility. Health literacy, including the ability to comprehend and act upon blood-glucose lab values, and healthcare access have been reported to affect productive communication with providers, which in turn affects adherence and glycemic goal attainment. These factors could be barriers to test-strip use and adherence. There is a lack of data analyzing the use of SMBG among indigent patient populations, who may be most affected by these issues. In one study of 20,555 patients registered with the TIDM Exchange, those without insurance and whose household income was low had fewer SMBG measurements per day.

The University of North Carolina (UNC) Medical Center Patient Assistance Program (PAP) is designed to help cover medication costs for indigent patients. To be eligible for the program, an individual must reside in North Carolina, have no other prescription drug benefits, including Medicaid, and have a household income equal to or lower than 200% of the federal poverty limit. At the time of this study, each prescription required a $4 copay. All refills were called in manually, and there were no automatic refill options. Interpreters were available via telephone for non–English-speaking patients. The prescriptions were limited to either a 30-day or 90-day supply but there were no restrictions on quantity, or required concomitant use of insulin therapy, and providers had the option of prescribing for any frequency of SMBG they felt was warranted. As part of PAP, clinical pharmacists helped to manage this particular population by telephone or by in-person medication therapy management via the Carolina Assessment of Medications Program (CAMP). Pharmacist involvement has been shown to improve patient adherence, and one randomized trial that incorporated targeted pharmacist visits for patients with uncontrolled diabetes showed both improved medication adherence and clinical outcomes.

Understanding the correlation between SMBG and glycemic control is important, as it can help to inform formulary management strategies. The cost of test strips is a large burden on the diabetes healthcare industry, and one of the main expenditures for PAP. The benefit on health outcomes of providing test strips at minimal or no cost to patients in an indigent population is unknown. The purpose of this study is to evaluate the utility of SMBG in an indigent patient population by determining whether adherence to SMBG impacts glycemic goal attainment. We hypothesize that if a clinical association exists, there will be an observable difference between patients who are adherent to SMBG and those who are not adherent.

**METHODS**

**Design:** This study was a retrospective cohort study conducted through the UNC Medical Center PAP. It was approved by the UNC Chapel Hill Medical Center Institutional Review Board.

**Study Population:** Patients were included in the study if they had an HbA1c measurement in 2016, were continuously enrolled in PAP during the study period, and had at least one day covered with test strips during the study period. Patients were excluded if they were under 18 years of age or pregnant.

**Adherence:** The study period was defined as the 90 days prior to HbA1c measurement. Adherence was calculated using the proportion of days covered (PDC), which we calculated using the number of days the patient had test strips available for use (days covered) and dividing it by the number of possible treatment days within the 90-day study period. Using possible treatment days as the denominator, rather than total days in the study period, prevented the underestimation of adherence. The number of possible treatment days was defined as the time between the index date (i.e., first “covered” day) and the date of HbA1c measurement. Using the PDC, we categorized patients as adherent if their PDC was at least 80%, as we previously described.

**Data variables and extraction:** We collected data variables including demographic data, diabetic medication-claims data, test-strip claims data, HbA1c, and the number of hospital and clinic encounters. Data on patient PAP eligibility, as well as medication and test strip claims, were accessed from the UNC Health Care outpatient pharmacy information system, Foundation Systems Incorporated (FSI). Data available in FSI for diabetic medication and test strip claims included the National Drug Code (NDC), the quantity dispensed, and the days-supply. Data on demographics, HbA1c, diagnosis, and encounters were collected from the UNC Health Care electronic medical record database, Carolina Data Warehouse (CDWH). The database included demographic variables; lab test description, date, and results; hospital encounter dates and associated diagnoses; the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) and the International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM); and procedural codes (in the Current Procedural Terminology, Fourth Edition [CPT-4]).

**Outcomes:** The primary outcome evaluated the difference between the proportion of subjects in the adherent and nonadherent groups who achieved glycemic control. Secondary outcomes included difference in hospitalizations and emergency department (ED) visits between adherent and nonadherent groups; difference in mean HbA1c between the adherent and nonadherent groups; difference in mean HbA1c between adherence groups based on therapeutic regimen, diabetes type, and insulin intensity; cost of test strips; and frequency of test-strip use. Hospitalizations and ED visits were measured within the 90 days prior to HbA1c testing.
**Blood Glucose Adherence and Glycemic Goal Attainment**

**Statistical analysis:** We compared continuous variables via Student’s t-test, and analyzed categorical variables via Fisher’s exact test. A 2-sided *P*-value < 0.05 was considered significant. To calculate PDC, we used SAS 9.4, and JMP Pro 12.0.1 was used to perform all other analyses. For the subgroup analysis, no adjustment was made to the *P*-value for multiple comparisons as it was a secondary outcome.

**RESULTS**

Of the 498 HbA1c encounters included in this study, 245 patients (49%) were adherent to SMBG and 253 patients (51%) were nonadherent to SMBG in the 90 days prior to HbA1c testing (Table 1). The mean PDC was 0.7 (standard deviation [SD], 0.3). There were no statistically significant characteristic differences between the adherent and nonadherent groups. Forty-five percent of subjects were male. In the adherent and nonadherent groups, the mean age was 49.5 years (SD, 10.4 years) and 48.4 years (SD, 10.9 years), respectively (Table 1). Among HbA1c encounters, 34 (14%) involved patients with T1DM in the adherence group and 29 (11%) involved patients with T1DM in the nonadherent group. Both groups were similar in racial diversity: 98 (40%) and 92 (36%) patients were Caucasian and 79 (32%) and 95 (38%) patients were African-American, in the adherent and nonadherent groups, respectively. Among adherent subjects, the mean number of prescribed test strips per covered day was 3.14 (SD, 1.4); among nonadherent subjects, the mean was 3.32 (SD, 1.6) (Table 1).

**Glycemic Control**

There was no statistically significant difference in the percentage of subjects at goal HbA1c (< 7%) between the adherent and nonadherent groups (20% vs. 25%; odds ratio [OR], 0.77; 95% CI, 0.51–1.18; *P* = 0.24) (Table 2). This endpoint remained nonsignificant among all the subgroups: T1DM, T2DM, insulin-treated, non–insulin-treated, MDI, and non-MDI. The mean (SD) HbA1c in the adherent group was 8.6% (1.9), compared to 8.8% (2.3) in the nonadherent group (*P* = 0.44) (Figure 1). In the subgroup analyses, only those patients having MDI had a significantly lower average HbA1c among the adherent group (8.86% vs. 9.57%; *P* = 0.009) (Figure 1). For patients with more than one HbA1c measurement in the 2016 calendar year (n = 161), there was no statistically significant difference in the change in HbA1c in those who were adherent to SMBG compared with those who were nonadherent to SMBG (−0.16 vs. −0.17; *P* = 0.67).

**Hospitalizations and ED Visits**

SMBG adherence was associated with an 80% reduction in diabetes-related hospitalizations compared to nonadherence (0.8% vs. 4%; OR, 0.2; 95% CI, 0.04–0.92) (Table 2). For all hospitalizations (n = 14) the primary admission diagnosis was related to hyperglycemia. Eleven hospital encounters were with patients on MDI, 10 of whom were diagnosed with T1DM. There was no difference in diabetes-related ED visits between the adherent groups (Table 2).

**Table 1** Study Population Characteristics

<table>
<thead>
<tr>
<th></th>
<th>Adherent (n = 245)</th>
<th>Nonadherent (n = 253)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Diagnosis, n (%)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type-1 diabetes</td>
<td>34 (14)</td>
<td>29 (11)</td>
</tr>
<tr>
<td>Type-2 diabetes</td>
<td>211 (86)</td>
<td>224 (89)</td>
</tr>
<tr>
<td><strong>Insulin Use</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insulin</td>
<td>153 (62)</td>
<td>160 (63)</td>
</tr>
<tr>
<td>No insulin</td>
<td>92 (38)</td>
<td>93 (37)</td>
</tr>
<tr>
<td><strong>Age, mean (SD)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>49.5 (10.4)</td>
<td>48.4 (10.9)</td>
<td></td>
</tr>
<tr>
<td><strong>Sex (male), n (%)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>110 (45)</td>
<td>114 (45)</td>
<td></td>
</tr>
<tr>
<td><strong>Body Mass Index, mean (SD)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34.1 (8.7)</td>
<td>33.0 (8.5)</td>
<td></td>
</tr>
<tr>
<td><strong>Race, n (%)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White or Caucasian</td>
<td>98 (40)</td>
<td>92 (36)</td>
</tr>
<tr>
<td>Black or African American</td>
<td>79 (32)</td>
<td>95 (38)</td>
</tr>
<tr>
<td>Other</td>
<td>68 (28)</td>
<td>66 (26)</td>
</tr>
<tr>
<td><strong>Ethnicity, n (%)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic or Latino</td>
<td>50 (20)</td>
<td>66 (26)</td>
</tr>
<tr>
<td>Not Hispanic or Latino</td>
<td>195 (80)</td>
<td>187 (74)</td>
</tr>
<tr>
<td><strong>Prescribed test strips/day, mean (SD)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.14 (1.4)</td>
<td>3.32 (1.6)</td>
<td></td>
</tr>
</tbody>
</table>

All interactions between groups had a *P*-value > 0.05.

*n* = number; SD = standard deviation

**Table 2** Primary Outcome and Healthcare Utilization

<table>
<thead>
<tr>
<th></th>
<th>Adherent (n = 245)</th>
<th>Nonadherent (n = 253)</th>
<th><em>P</em>-Value</th>
<th>Odds Ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary Outcome, n (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportion at goal HbA1c (&lt; 7%)</td>
<td>50 (20%)</td>
<td>63 (25%)</td>
<td>24</td>
<td>0.77 (0.51–1.18)</td>
</tr>
<tr>
<td><strong>Healthcare Utilization, n (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diabetes-related ED visits</td>
<td>6 (2)</td>
<td>6 (2)</td>
<td>0.00</td>
<td>1.03 (0.33–3.25)</td>
</tr>
<tr>
<td>Diabetes-related hospitalizations</td>
<td>2 (0.8)</td>
<td>10 (4)</td>
<td>0.04</td>
<td>0.2 (0.04–0.92)</td>
</tr>
<tr>
<td>Endocrinology visits</td>
<td>67 (27)</td>
<td>79 (31)</td>
<td>38</td>
<td>0.83 (0.56–1.22)</td>
</tr>
<tr>
<td>CAMP clinical pharmacist visit</td>
<td>62 (25)</td>
<td>36 (14)</td>
<td>002</td>
<td>2.04 (1.295–3.222)</td>
</tr>
<tr>
<td>PCP visits</td>
<td>180 (73)</td>
<td>170 (67)</td>
<td>14</td>
<td>1.35 (0.92–1.99)</td>
</tr>
</tbody>
</table>

CAMP = Carolina Assessment of Medications Program; CI = confidence interval; ED = emergency department; HbA1c = hemoglobin A1c; n = number; PCP = primary care provider
Blood Glucose Adherence and Glycemic Goal Attainment

Frequency of Testing

More test strips per day were prescribed for patients with HbA1c > 7% (3.42 vs. 2.60; *P* < 0.001). There were no statistically significant differences in the number of test strips prescribed per day among adherent and nonadherent patients, and the effect remained nonsignificant in subgroup analyses by insulin usage and type of diabetes (Table 3).

Factors Affecting SMBG Adherence

Patients who had at least one visit with a clinical pharmacist for medication therapy management via CAMP, during the 90 days prior to HbA1c testing, were twice as likely to be adherent to SMBG (63% vs. 46%; OR, 2.04; 95% CI, 1.30–3.22). However, visits with an endocrinologist and primary care provider were not associated with improved adherence (Table 2).

Cost of Testing Supplies

The overall cost of test strips for PAP during the 90-day study period for each of the 498 HbA1c patient encounters in 2016 was $209,227. The cost for non-adherent patients (n = 253) was $110,280, and for non–insulin-treated patients (n = 185), the cost was $62,423, or $337 per patient. For patients with HbA1c < 7% (n = 113), the cost was $38,574. Meter kits were obtained at no charge through the manufacturer’s assistance program. Lancet costs were negligible, and accounted for $398 across all pharmacy assistance patients.

DISCUSSION

No association was found between test-strip adherence and being at the HbA1c goal (< 7%) in an indigent population without test-strip formulary restrictions. The lack of SMBG utility is similar to that indicated in the current literature, which shows a mixed benefit from SMBG on HbA1c in patients with T2DM and non–insulin-treated patients.12,13,24 Charity et al., in a retrospective cohort study of 164 patients with diabetes mellitus in Kenya, showed no association between adherence to SMBG and glycemic control (HbA1c < 7% or reduction from baseline HbA1c > 2%) at 12 months.24 However, their study was limited by the low adherence rates in both groups, with only 10% of patients remaining adherent by the end of 12 months, which raises the question of whether the lack of SMBG benefit in the study was a result of the lack of adherence. Our study helps to address this question by demonstrating similar results to Charity et al., with a rate of adherence of 49% and an average PDC of 0.7.

Our study also provides additional evidence to support the idea that the generation of blood-glucose data alone is insufficient for improving health outcomes. Reaching goal HbA1c is multifactorial, and SMBG alone is insufficient to achieve glycemic control.10 Other important factors are the availability and clinical utility of that data, as demonstrated by Polonosky et al. in a prospective randomized trial.
with structured testing instructions provided to the patients and providers, which resulted in significantly greater reductions in HbA1c compared to an active control group who were performing testing-as-usual care.7 Furthermore, there was no difference in the average number of test strips prescribed to the adherent and nonadherent groups (Table 1), suggesting that the quantity of test strips itself was not a major confounding factor in the current study.

Among the subgroups analyzed, the only statistically significant difference in mean HbA1c was seen in the MDI subgroup. Among the patients taking insulin, those having MDI were more likely to have a lower HbA1c in the adherent group than in the non-adherent group. This might be due to adjustments that can readily be made in response to the data, namely insulin-dose adjustments. For patients taking only basal insulin, there is less flexibility to adjust the insulin dose to match daily blood glucose fluctuations. The ADA suggests that SMBG may be useful for some individuals who are not having MDI for guiding behavioral and lifestyle adjustments.7 Further research is needed to determine standards for optimizing the use of SMBG data to inform clinical decisions and self-management. The positive association of SMBG adherence with lower HbA1c for MDI regimens would seem to agree with current studies that show a similar association with SMBG and patients with T1DM.8,9 Although we did not show a significant association in patients with T1DM, the percentage of subjects with T1DM was small compared to the overall study population and may not have been sufficiently powered to detect a difference. Our study also did not assess whether subjects with T1DM were on an insulin pump. In addition, the indigent population might have been less likely to have the adequate resources, health literacy, or healthcare follow-up to make the appropriate medication and lifestyle adjustments in response to their SMBG values.10,25,26 Patients with a higher HbA1c might also receive more targeted interventions to improve their adherence. Given the difference between this and other studies, more research is required to elucidate population-specific factors that might influence health outcomes.

The association of SMBG adherence with reduced diabetes-related hospitalizations suggests SMBG’s potential benefit as preventing dangerous glycemic excursions and as an early detector for worsening glycemic control that requires hospitalization. Few studies have looked at this outcome in association with SMBG adherence, as they did not find a statistically significant association.24 However, Charity et al. looked at combined hospitalizations or ED visits, while our study looked at each of these separately. In the present study, no difference was seen in ED visits. The reduction in hospitalizations is an important outcome, as it could signify an area to target for improving health outcomes and reducing overall costs. The ADA standards of care suggest that SMBG for patients with T2DM who are not having MDI could be beneficial for detecting asymptomatic hyperglycemia and hypoglycemia; this is supported by our study’s findings, which show an association between SMBG adherence and reduced diabetes-related hospitalizations. More studies are required to assess the reduction in diabetes-related hospitalizations based on SMBG adherence and to quantify the optimal SMBG frequency for non–insulin-treated patients in order to maximize safety while minimizing total cost of care.

Clinical pharmacist medication-therapy management visits were the only identified factor associated with increased adherence, which suggests that prescribing SMBG should coexist with education, close monitoring, and specific follow-up. These data agree with that from other studies that have shown improved adherence with targeted interventions from pharmacists.21 One potential intervention for improving adherence in the PAP patient population is to target SMBG users for visits with a clinical pharmacist. Clinical follow-up after test-strip dispensing may improve adherence and ensure the appropriate use of test-strip data. Externally, these data also suggest a role for pharmacists in counseling patients on interpreting and acting upon their SMBG results with each test-strip dispensation.

In the current study, the average prescribed test-strip frequency was greater than three times per day. The Centers for Medicare and Medicaid Services considers patients as high-utilization if they use more than 100 test strips every month if they are insulin-treated or more than 100 test strips every 90 days if they are non–insulin-treated.27 Per the average test-strip usage in our study, the patients on non-insulin regimens would fall into the category of high utilization; the findings support the need to reevaluate the amount of test strips that are required to adequately manage patients on a non-insulin regimen.

Without a clear association between SMBG and HbA1c goal attainment, health plans without restrictions already in place might realize cost savings from the addition of targeted restrictions—such as quantity limits for patients with oral-only diabetes medications—without negatively affecting clinical outcomes. Simon et al. found that increased SMBG in patients with non–insulin-treated T2DM, in the absence of additional education on interpreting SMBG, was associated with increased healthcare costs and a decreased quality of life.4 Like Simon et al., our study suggests that the provision of low-copay test strips by a healthcare organization has minimal impact on glycemic outcomes except for patients on MDI.

**Limitations**

One limitation of our study is its retrospective nature. Given the study design, there was insufficient data available to assess specific SMBG instructions from patients’ providers. An HbA1c goal of less than 7% was chosen as the primary endpoint in accordance with the 2019 ADA standards of care. However, actual targeted goals can vary among patients, based on patient-specific factors. As PDC calculations were based on claims data rather than actual usage, there could be errors both in assuming how many test strips were used per day and how many were intended to be used each day by the patient’s provider. Our study was not able to take into consideration whether or not prescribers had instructed patients to test at a different frequency than that reflected in the quantity and days-supply set out at the pharmacy. Furthermore, calculating PDC only for a 90-day period could result in greater variability in calculated adherence and might not represent a patient’s long-term adherence pattern. Lastly, there could also be a selection bias toward higher prescribed test-strip quantity per day for patients whose condition is uncontrolled.
CONCLUSION

SMBG alone is not a good predictor of HbA1c goal attainment, indicating that population-wide formulary coverage of test strips has minimal impact on improving glycemic outcomes. Therefore, health plans might benefit from formulary restrictions as a strategy to provide more cost-effective care, without negatively impacting glycemic control. In addition, the use by health plans of targeted interventions (e.g., education, pharmacist visits, and follow-up) could help maximize the clinical benefit of SMBG for patients who do receive test strips. However, more research is needed to define which patients would be most likely to benefit.

REFERENCES