Integrating Chronic Care into Family Practice: Blending the Paradigms

David L. Tetrick, MD, and Christopher G. Parkin, MS

Type 2 diabetes is a growing health concern in the United States. The most recent report from the Centers for Disease Control and Prevention estimates that almost 25 million Americans have type 2 diabetes; an additional 79 million have prediabetes.[1] Although it has been shown that early and aggressive treatment of hyperglycemia and other risk factors reduces the development and progression of complications,[2–4] < 8% of patients with diabetes are at their recommended treatment goals for glycemia, lipids, and blood pressure.[5]

A key contributor to poor diabetes control is clinical inertia; many clinicians do not initiate or intensify therapy appropriately during patient visits.[6–8] In primary care practices, where the vast majority of patients with diabetes receive their care, clinical inertia often results from a combination of factors, including lack of time and resources, inadequate clinical information regarding patients' glycemic status, lack of understanding regarding appropriate use of diabetes medications, and clinicians' discouragement regarding patients' disengagement with their self-care. All of these factors occur as a result of the acute care model that currently guides the delivery of health care to patients.

Within the majority of health care settings, primary care providers are challenged to treat acute conditions (e.g., injuries and infections) and, simultaneously, to manage chronic conditions such as diabetes.

However, to effectively address the progressive nature of type 2 diabetes, which is characterized by both insulin resistance and relentless β-cell deterioration, clinicians must persistently monitor and adjust therapy.[9] Additionally, diabetes management is predominantly self-directed, in that individuals are responsible for the day-to-day decisions related to controlling their disease.[10] Therefore, clinicians are further challenged to incorporate patient counseling and motivation into their care strategies to engage patients in their own self-management. Persistent clinical management supported by ongoing patient counseling and support are requisite components of an effective chronic care model as it relates to diabetes care.

The use of structured self-monitoring of blood glucose (SMBG)—an approach in which blood glucose data are generated according to a defined regimen, interpreted, and then utilized to make appropriate pharmacological and lifestyle adjustments—may address some of the challenges that contribute to clinical inertia. Several recent studies have shown that structured SMBG promotes healthy lifestyle changes and facilitates therapy optimization, leading to improved clinical outcomes.[11–16]

This article describes how a comprehensive intervention, driven by structured SMBG and supported by the use of Internet resources and group patient education, has been used to improve patient care and clinical outcomes in a primary care setting in Indianapolis, Ind.

Use of a Structured SMBG-Based Intervention

In 2010, we observed a marked increase in retinopathy, renal disease, and lower-limb amputations within our patient population. Because we lacked complete or reliable SMBG data, therapy adjustments were based primarily on A1C levels and patient reports of hypoglycemia.

During that same time period, Roche Diagnostics introduced a simple paper tool (ACCU-CHEK 360° View, Roche Diagnostics, Indianapolis, Ind.) that patients can use to generate seven-point blood glucose profiles during 3 consecutive days (Figure 1). The tool also provides patients with the opportunity to document their meal sizes

IN BRIEF

The Structured Testing Program (STeP) trial demonstrated that use a structured self-monitoring of blood glucose intervention improves clinical outcomes, prompts earlier and persistent treatment adjustments, and increases patients' self-confidence and motivation associated with their diabetes self-management. This article discusses the experience of implementing the STeP intervention in a primary care practice.

and energy levels and to comment on their SMBG experiences.

The tool was proven effective in the Structured Testing Program (STeP) study,[12] a large (n = 483), cluster-randomized, multicenter clinical trial conducted in primary care settings. In this study, participants who used the tool experienced improvements in A1C and other glycemic measures, earlier initiation and persistent adjustment of treatment, and enhanced understanding, resulting in increased self-efficacy and motivation in managing their diabetes.[17] A unique aspect of the tool was its emphasis on postprandial glucose excursions, which heretofore had played a limited role in our clinical decision-making.

To assess the usefulness of this tool in our practice, we selected 25 patients with type 2 diabetes and A1C levels > 7.5%. Patients were asked to complete the tool and return within 3 weeks for a follow-up visit. Twenty-four patients (95%) completed the tool and attended their follow-up visit.

In reviewing the data with patients, it became clear that using the tool had enhanced their overall understanding of diabetes and their own self-management regimen. Unlike meter download software programs, which patients often do not review until their clinic visits, use of the tool provides immediate feedback regarding the impact of diet decisions, physical activity, and medications on glucose levels, leading to more timely and appropriate lifestyle changes as needed. Many patients documented on the tool their understanding of the link between the content and size of their meals and the resulting postprandial glucose excursions (e.g., "I need to eat less at breakfast.").

The tool was also found to be helpful in making medication changes, using the four-step pattern management process employed in the STeP study (Table 1).[12] This four-step process is a systematic approach to identifying existing glycemic abnormalities, determining their clinical relevance, investigating their potential causes, and addressing them with appropriate adjustments in therapy. The first step in the process is to identify the glycemic abnormality. If an abnormality is detected, the next step is to determine whether it is a recurring issue that needs to be addressed (i.e., occurs at the same time on two of the three days) or an anomaly. Through review of current medications and patient discussions, we explore the potential cause(s) of the abnormality. Is the patient taking the appropriate medication to address abnormality? Is the dose adequate? Is the patient taking the medication as prescribed? Have the patient's eating habits or activity routine changed? Once possible causes of the abnormality have been determine, the next step is to identify the most appropriate change(s) in therapy, whether pharmacological or lifestyle issues.

Clinicians are encouraged to review and prioritize the issues to be addressed. The first priority is to identify and prevent recurrent or severe hypoglycemia. The next priority is to address any pattern of fasting or preprandial hyperglycemia. The last priority is to identify and treat postprandial hyperglycemia, which is defined as any postprandial glucose excursion > 50 mg/dl above the preprandial glucose level.

To integrate use of the structured SMBG intervention into our practice setting, we initiated simple but significant changes in workflow. Specifically, patients receive a reminder phone call 2 weeks before their scheduled annual examination. They are asked to visit the local laboratory at least 1 week before their annual examination for previously
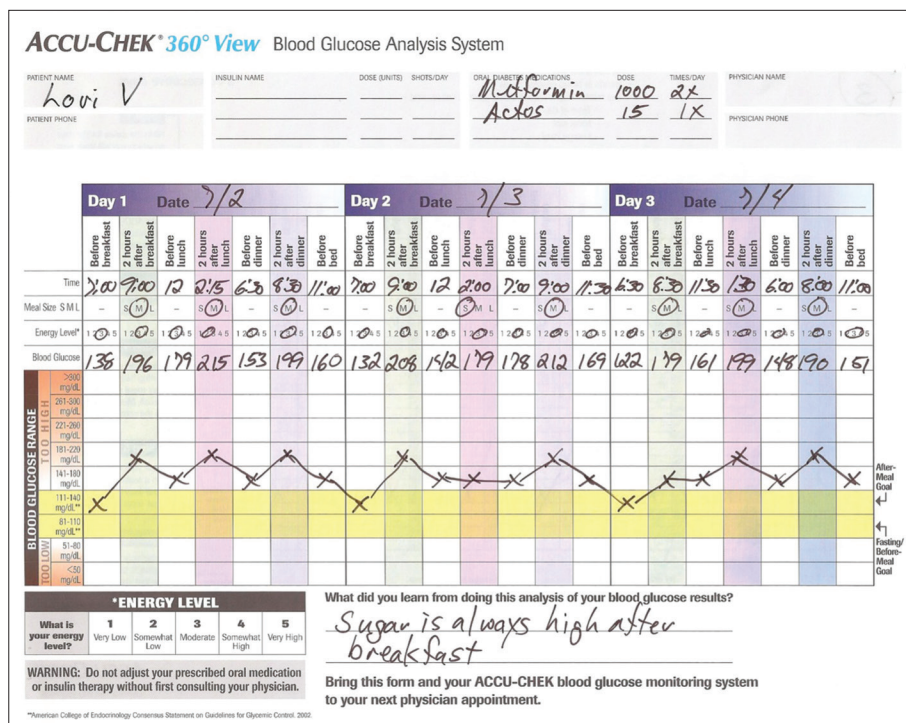

Figure 1. Example of a completed SMBG tracking tool.

ordered routine blood work. This facilitates review of the results before the patient's clinic visit. Patients are asked to complete a 360° View tool before each visit to self-assess their glycemic status. During the annual visit, we discuss laboratory results, review the tool, and collaboratively set goals for the year.

Patients with stable glycemic control are seen 6 months after their annual exam. If deterioration in glucose control is detected, patients are cycled into quarterly visits. Patients with unstable glycemic control are scheduled for follow-up visits at 3, 6, and 9 months. The physician sees the patient at the 6-month visit, and the nurse practitioner (NP) sees the patient at the 3- and 9-month visits. Before each visit, patients are asked to complete the 360° View tool for review during the visit. If a medication change is made, patients are asked to return in 1 month with another completed tool.

Leveraging Internet Resources

Another resource we use is the Diabetes Rx Web site, which is linked to the American Diabetes Association Web site (www.diabetes.org) and the "Diabetes Pro" page for health care professionals. The Web site provides access to > 18,000 resources about thousands of medications and medical devices, as well as current information about billing and coding.

We have used the Web site primarily to obtain disease state education materials, medication references, product information, and access to patient-assistance programs. Once appropriate information is identified, it can be forwarded directly to the patient in a print or electronic format. These resources allow us to put appropriate information into our patients' hands before they leave the clinic or provide follow-up opportunities to reinforce discussions.

Use of Group Education to Improve Patient Knowledge and Engagement

We initiated group education sessions to help patients acquire the knowledge and skills they need to appropriately self-manage their disease. Initially, our groups were structured to include time to perform the physical exams required to obtain reimbursement. However, this proved to be disruptive. To realize the potential benefits of the group process, our group visits now consist of 1-hour didactic sessions covering specific topics and are facilitated by our NP and nurse coach. Occasionally, a registered dietitian or certified diabetes educator from outside our practice will present more focused information about specific aspects of diabetes management (e.g., injection therapy or use of insulin pumps).

At the end of the 1-hour sessions, patients identify personal goals and strategies they intend to pursue to improve their self-management. Follow-up then occurs with patients to discuss their progress toward the goals they set at the session. Group sessions have recently been expanded to address other chronic conditions such as hypertension and hyperlipidemia. All sessions are offered free of charge.

Summary

Although our approach to diabetes management focuses on the use of blood glucose data, it is important to understand that simply performing SMBG per se does not affect blood glucose levels, nor would we expect it to, any more than we would expect the performance of A1C testing to affect blood glucose levels. In essence, SMBG and A1C are only measures of glycemic control; the clinical utility and cost-effectiveness of these tests are dependent solely on the degree to which the resulting data are appropriately and consistently utilized to adjust pharmacological therapies and/or modify lifestyle behaviors.

It is our position that SMBG has the potential to facilitate long-term improvement in glycemic status only when the following conditions are met: *1)* the testing regimen is structured (both in timing and frequency) to obtain actionable information about each patient's glucose control; *2)* the data are generated and documented in a manner that facilitates analysis and discussion of glycemic patterns between patient and health care provider; *3)* both the patient and the health care provider possess the knowledge, skills, and willingness to make appropriate treatment decisions based on the SMBG data; and *4)* treatment decisions and modifications are mutually agreed on by the patient and the health care provider.

Our evidence-based, structured SMBG intervention combines these elements into an effective chronic-care approach to managing our patients with diabetes. The 360°

Table 1. Four-Step Pattern Management Process Pattern[12]

The four-step process is a systematic approach to identifying and addressing relevant patterns of glycemic control.
• **Step 1:** Identify the glycemic abnormality.
  ○ Priority 1: Hypoglycemia
  ○ Priority 2: Fasting hyperglycemia
  ○ Priority 3: Postprandial hyperglycemia
• **Step 2:** Determine the timing and frequency of the abnormality's occurrence.
• **Step 3:** Investigate potential causes for the abnormality.
• **Step 4:** Take action.

View tool allows our patients to collect and graph blood glucose data in a manner that clearly illustrates how their eating, physical activity, and medications affect their glucose levels throughout the day. Group education sessions, supported by the use of Internet resources, give them the knowledge to use this information to make adjustments in their health behaviors, but also motivates and empowers them to follow their diabetes self-management regimens, as was demonstrated in the STeP trial.[17]

When patients are knowledgeable about their diabetes, engaged in their self-management, and armed with meaningful glucose information, we can then use the four-step process to accurately assess their glycemic status and work collaboratively with them to make appropriate, mutually agreed on changes in their treatment regimens.

Since initiating this structured SMBG-based intervention, we have seen significant improvements in our patients' glycemic control; average A1C values have decreased from 7.7 to ~ 6.4%. However, initiating this intervention requires time and commitment; workflow and practice protocols cannot change clinical processes overnight.

Clearly, new approaches are needed to engage patients and their clinicians in diabetes management and promote optimal diabetes treatment. However, a structured SMBG-based intervention requires a blending of paradigms of health care delivery and slow integration of the principles of chronic care management into our practices. Through these efforts, both patient outcomes and practice efficiencies can be improved.

REFERENCES

[1]Centers for Disease Control and Prevention: National diabetes fact sheet 2011: national estimates and general information on diabetes and prediabetes in the United States, 2011. Atlanta, Ga., U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2011

[2]U.K. Prospective Diabetes Study Group: Intensive blood-glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes (UKPDS 33). *Lancet* 352:837–853, 1998

[3]Holman RR, Paul SK, Bethel MA, Paul SK, Bethel MA, Matthews DR, Neil HA: 10-year follow-up of intensive glucose control in type 2 diabetes. *N Engl J Med* 359:577–589, 2008

[4]Gaede P, Lund-Andersen H, Parving HH, Pedersen O: Effect of a multifactorial intervention on mortality in type 2 diabetes. *N Engl J Med* 358:580–591, 2008

[5]Saydah SH, Eberhardt MS, Loria CM, Brancati FL: Age and the burden of death attributable to diabetes in the United States. *Am J Epidemiol* 156:714–719, 2002

[6]Phillips LS, Branch WT, Cook CB, Doyle JP, El-Kebbi IM, Gallina DL, Miller CD, Ziemer DC, Barnes CS: Clinical inertia. *Ann Intern Med* 135:825–834, 2001

[7]Brown JB, Nichols GA: Slow response to loss of glycemic control in type 2 diabetes mellitus. *Am J Manag Care* 9:213–217, 2003

[8]Nichols GA, Koo YH, Shah SN: Delay of insulin addition to oral combination therapy despite inadequate glycemic control: delay of insulin therapy. *J Gen Intern Med* 22:453–458, 2007

[9]Unger J, Parkin CG: Appropriate, timely and rational treatment of type 2 diabetes mellitus: meeting the challenges of primary care. *Insulin* 4:144–157, 2009

[10]Funnell MM, Brown TL, Childs BP, Haas LB, Hosey GM, Jensen B, Maryniuk M, Peyrot M, Piette JD, Reader D, Siminerio LM, Weinger K, Weiss MA: National standards for diabetes self-management education. *Diabetes Care* 31(Suppl. 10):S97–S104, 2008

[11]Duran A, Martin P, Runkle I, Perez N, Abad R, Fernandez M, Del Valle L, Sanz MF, Calle-Pascual AL: Benefits of self-monitoring blood glucose in the management of new-onset type 2 diabetes mellitus: the St Carlos Study, a prospective randomized clinic-based interventional study with parallel groups. *J Diabetes* 2:203–211, 2010

[12]Polonsky WH, Fisher L, Schikman CH, Hinnen DA, Parkin CG, Jelsovsky Z, Petersen B, Schweitzer M, Wagner RS: Structured self-monitoring of blood glucose significantly reduces A1C levels in poorly controlled, noninsulin-treated type 2 diabetes: results from the Structured Testing Program study. *Diabetes Care* 34:262–267, 2011

[13]Franciosi M, Lucisano G, Pellegrini F, Cantarello A, Consoli A, Cucco L, Ghidelli R, Sartore G, Sciangula L, Nicolucci A: ROSES: role of self-monitoring of blood glucose and intensive education in patients with type 2 diabetes not receiving insulin: a pilot randomized clinical trial. *Diabet Med* 28:789–796, 2011

[14]Bonomo K, De Salve A, Fiora E, Mularoni E, Massucco P, Poy P, Pomero A, Cavalot F, Anfossi G, Trovati M: Evaluation of a simple policy for pre- and post-prandial blood glucose self-monitoring in people with type 2 diabetes not on insulin. *Diabetes Res Clin Pract* 87:246–251, 2010

[15]Kempf K, Kruse J, Martin S: ROSSO-in-praxi: a self-monitoring of blood glucose-structured 12-week lifestyle intervention significantly improves glucometabolic control of patients with type 2 diabetes mellitus. *Diabetes Technol Ther* 12:547–553, 2010

[16]Mohan V, Ravikumar R, Poongothai S, Amutha A, Sowmya S, Karkhuzali K, Parkin CG: A single-center, open, comparative study of the effect of using self-monitoring of blood glucose to guide therapy on preclinical atherosclerotic markers in type 2 diabetic subjects. *J Diabetes Sci Technol* 4:942–948, 2010

[17]Fisher L, Polonsky WH, Parkin CG, Jelsovsky Z, Petersen B, Wagner RS: The impact of structured blood glucose testing on attitudes toward self-management among poorly controlled, insulin-naive patients with type 2 diabetes. *Diabetes Res Clin Pract* 96:149–155, 2012

David L. Tetrick, MD, is board certified in internal medicine and has been practicing medicine in Indianapolis, Ind., for 25 years. Christopher G. Parkin, MS, is a clinical researcher and medical writer specializing in the development of diabetes education and information relevant to diabetes management for more than 32 years.