

Self-Monitoring of Blood Glucose in Patients with Type 2 Diabetes Not Using Insulin

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The Cochrane Abstract on the next page is a summary of a review from the Cochrane Library. It is accompanied by an interpretation that will help clinicians put evidence into practice. Dr. Cordts presents a clinical scenario and question based on the Cochrane Abstract, followed by an evidence-based answer and a critique of the review. The practice recommendations in this activity are available at <http://www.cochrane.org/reviews/en/ab005060.html>.



This clinical content conforms to AAFP criteria for evidence-based continuing medical education (EB CME). See CME Quiz on page 871.

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Clinical Scenario

A 48-year-old man with type 2 diabetes mellitus who has been on oral diabetes medications for the past three years presents to your office as a new patient. He has never monitored his blood glucose readings, but he recently attended a diabetes support group where it was suggested that he start. He asks you if monitoring his blood glucose readings would be useful in managing his diabetes.

Clinical Question

Does self-monitoring of blood glucose improve glycemic control or patient-oriented outcomes in patients who have type 2 diabetes but are not using insulin?

Evidence-Based Answer

For patients who have had diabetes longer than one year and are not using insulin, evidence suggests that the benefit of self-monitoring of blood glucose in lowering A1C levels is small at six months and disappears by 12 months. Self-monitoring of blood glucose does not improve health-related quality of life, general well-being, or patient satisfaction. (Strength of Recommendation: B, based on inconsistent or limited-quality patient-oriented evidence.)

Practice Pointers

Type 2 diabetes is the leading cause of new cases of blindness, kidney failure, and non-traumatic lower extremity amputations in the United States.¹ Of the estimated 25 million U.S. adults with diabetes, almost 75 percent manage their disease with lifestyle modifications, oral medications, or both.¹ Self-monitoring of blood glucose may be recommended as part of a comprehensive disease management strategy.² For patients

with type 2 diabetes who use insulin, expert consensus and low-quality evidence support the effectiveness of self-monitoring.²⁻⁴ This Cochrane review examined the utility of self-monitoring of blood glucose in patients with diabetes who do not require insulin therapy.⁵

Nine trials comparing self-monitoring of blood glucose versus usual care without testing in persons who had diabetes for at least one year showed a statistically significant difference of 0.3 percent in A1C measurements at six months in favor of self-monitoring; however, two trials that extended follow-up to one year showed no statistically significant differences. There were no significant differences between the groups who self-monitored their blood glucose and the control groups in patient-oriented outcomes such as health-related quality of life, overall well-being, and patient satisfaction.

Two small trials that compared self-monitoring of blood glucose and self-monitoring of urine glucose in persons who had diabetes for at least one year showed no statistically significant difference in A1C measurements at six months. For patients with newly diagnosed diabetes, two trials comparing self-monitoring of blood glucose versus usual care showed a statistically significant decrease of 0.5 percent in A1C measurements at 12 months in the self-monitoring group. However, differences in education on lifestyle modifications and drug interventions between the groups made it unclear whether self-monitoring of blood glucose was actually responsible for the observed effects.

Other outcomes, such as hypoglycemic episodes, were not analyzed because of differences in how the studies defined hypoglycemia and the inherent bias of patients who

Cochrane Abstract

Background: Self-monitoring of blood glucose (SMBG) has been found to be effective for patients with type 1 diabetes mellitus and for patients with type 2 diabetes using insulin. There is much debate on the effectiveness of SMBG as a tool in the self-management of patients with type 2 diabetes who are not using insulin.

Objectives: To assess the effects of SMBG in patients with type 2 diabetes who are not using insulin.

Search Strategy: Multiple electronic bibliographic and ongoing trial databases were searched, supplemented with hand searches of references of retrieved articles. The date of the most recent search was July 7, 2011.

Selection Criteria: Randomized controlled trials investigating the effects of SMBG compared with usual care, self-monitoring of urine glucose, or both in patients with type 2 diabetes who were not using insulin. Studies that used the A1C level as a primary outcome were eligible for inclusion.

Data Collection and Analysis: Two authors independently extracted data from included studies and evaluated the studies' risk of bias. Data from the studies were compared to decide whether they were sufficiently homogeneous to pool in a meta-analysis. Primary outcomes were A1C measurements, health-related quality of life, well-being, and patient satisfaction. Secondary outcomes were fasting plasma glucose level, hypoglycemic episodes, morbidity, adverse effects, and costs.

Main Results: The authors examined 12 randomized controlled trials and evaluated outcomes in 3,259 randomized patients. Intervention duration ranged from six months (26 weeks) to 12 months (52 weeks). Nine trials compared SMBG with usual care without monitoring, one study compared SMBG with self-monitoring of urine glucose, one three-armed trial compared SMBG and self-monitoring of urine glucose with usual care, and one three-armed trial compared less intensive SMBG and more intensive SMBG with a control group. Seven out of 11 studies had a low risk of bias for most indicators. Meta-analysis of studies that included patients with a diabetes duration of one year or more showed a statistically significant SMBG-induced decrease in A1C levels at up to six months

of follow-up (−0.3; 95% confidence interval [CI], −0.4 to −0.1; 2,324 participants, nine trials), yet an overall statistically nonsignificant SMBG-induced decrease was seen at 12-month follow-up (−0.1; 95% CI, −0.3 to 0.04; 493 participants, two trials). Qualitative analysis of the effect of SMBG on well-being and quality of life showed no effect on patient satisfaction, general well-being, or general health-related quality of life.

Two trials reported costs of self-monitoring. One trial compared the costs of self-monitoring of blood glucose with self-monitoring of urine glucose based on nine measurements per week and with the prices in U.S. dollars for self-monitoring in 1990. The authors concluded that total costs in the first year of self-monitoring of blood glucose, with the purchase of a blood glucose meter, were 12 times more expensive than self-monitoring of urine glucose (\$481 or 361 EURO [11/2011 conversion] versus \$40 or 30 EURO [11/2011 conversion]). Another trial reported a full economic evaluation of the costs and effects of self-monitoring. At the end of the trial, costs for the intervention were £89 (104 EURO [11/2011 conversion]) for standardized usual care (control group), £181 (212 EURO [11/2011 conversion]) for the less intensive self-monitoring group, and £173 (203 EURO [11/2011 conversion]) for the more intensive self-monitoring group. Higher losses to follow-up in the more intensive self-monitoring group were responsible for the difference in costs, compared with the less intensive self-monitoring group. There were few data on the effects on other outcomes, and these effects were not statistically significant. None of the studies reported data on morbidity.

Authors' Conclusions: From this review, the authors conclude that when diabetes duration is more than one year, the overall effect of self-monitoring of blood glucose on glycemic control in patients with type 2 diabetes who are not using insulin is small up to six months after initiation and subsides after 12 months. Furthermore, based on a best-evidence synthesis, there is no evidence that SMBG affects patient satisfaction, general well-being, or general health-related quality of life. More research is needed to explore the psychological impact of SMBG and its impact on diabetes-specific quality of life and well-being, as well as the impact of SMBG on hypoglycemia and diabetic complications.



These summaries have been derived from Cochrane reviews published in the Cochrane Database of Systematic Reviews in the Cochrane Library. Their content has, as far as possible, been checked with the authors of the original reviews, but the summaries should not be regarded as an official product of the Cochrane Collaboration; minor editing changes have been made to the text (<http://www.cochrane.org>).

self-monitored their blood glucose reporting a higher incidence of symptomatic and asymptomatic hypoglycemia compared with those in the control group. Two trials that evaluated the cost of testing showed higher costs for self-monitoring of blood glucose compared with usual care or self-monitoring of urine glucose.

The American Diabetes Association suggests that self-monitoring of blood glucose may be effective in select patients not using insulin and recommends that those patients receive education on how to use the self-monitoring data to adjust therapy.² In contrast, the results of this review indicate that any benefits from self-monitoring of blood glucose are short-term, and possibly limited to patients with newly diagnosed diabetes. For those who have been diagnosed with diabetes for more than one year, especially those whose blood glucose levels are well controlled without insulin, the evidence supports discontinuing (or not initiating) self-monitoring of blood glucose because of the added cost

and inconvenience of testing and lack of improvement in patient-oriented outcomes.

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