



Self-monitoring of blood glucose in type 2 diabetes

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Summary

Recent evidence suggests that patients with type 2 diabetes who are not taking insulin may not benefit from self-monitoring of blood glucose. Patients with diabetes who require insulin have to monitor their blood glucose by finger-prick (capillary) testing up to 3–4 times or more a day along with their 1–5 insulin injections. The need for this is widely accepted, but the principle of frequent daily monitoring is also applied to people who are not on insulin.

Key words: hypoglycaemic drugs, insulin.

(Aust Prescr 2010;33:138–40)

Introduction

A recent systematic review from Canada¹ suggests that patients with type 2 diabetes who are not taking insulin do not require self-monitoring of blood glucose (see box). Type 2 diabetes is increasingly common, so there may be significant costs associated with widespread use of blood glucose testing by these patients. For example, in Ontario blood glucose test strips represented the third largest annual cost to the Ontario Public Drug Program – over CA\$107 million, or 3.3% of total drug expenditure in the program.

On 1 January 2010, the Australian Government increased the co-contribution for blood glucose test strips under the National Diabetes Services Scheme from AU\$14.10 to AU\$14.30 for 100 strips. However, the overall cost is much higher – around \$50–60 per box of 100. The National Diabetes Services Scheme supplied nearly three-quarters of a million boxes of varying size to these patients in 2008. If this ceased, significant sums of money could be spent on other areas of diabetes care.

Current practice in Australia

Many doctors would recommend self-monitoring to people with type 2 diabetes who do not require insulin. Self-monitoring of blood glucose is discussed as part of their diabetes education. The choice of test and timing and frequency of monitoring is negotiated between the patient and their healthcare professionals, taking into account the type of therapy, level of glycaemic control, risk of hypoglycaemia and need for

Box

Key messages about self-monitoring of blood glucose in type 2 diabetes¹

- People managed by diet alone or who are using metformin alone or in combination with acarbose or DPP-4 inhibitor do not need routine self-monitoring of blood glucose
- People who are on a sulfonylurea either alone or in combination with other oral therapy may need to test their blood glucose periodically because of an increased risk of hypoglycaemia
- Periodic testing may be required in people on oral therapy to monitor blood glucose responses to changes in therapy or when unstable glucose levels are anticipated, e.g. during acute illness or surgery, or when there is a risk of hypoglycaemia (prolonged fasting)
- Testing up to 14 times/week should be sufficient for most people on basal insulin with oral drugs
- To achieve optimal control, people who are using basal-bolus regimens should individualise self-monitoring of blood glucose to guide adjustment of insulin
- Self-monitoring of blood glucose should be used in conjunction with regular HbA1c measurements according to guidelines to assess day-to-day control
- Such testing should be linked to specific patient actions such as insulin dose self-adjustment or detection and treatment of hypoglycaemia

short-term adjustment of treatment. Self-care of diabetes often varies in the course of a person's life, with periods of intense monitoring around medical crises and clinic visits, and little or no monitoring at other times. In theory, patients, doctors and diabetes educators review the results of self-monitoring and together make decisions on actions to be taken to improve diabetes care. In practice this may not occur as often as doctors believe. While Canadian doctors reported that they routinely reviewed monitoring results, patients reported the opposite.²

Is there enough evidence for a change in practice?

Many systematic reviews have looked at this question. However, their conclusions are only as good as the trials available for

analysis. In real life, compliance with self-monitoring of blood glucose may have been poor. There are no studies assessing how well people actually implement the advice they are given on when to test and what to do with their results.

While slight variations in the research question have led to slight differences in the inclusion criteria of the reviews, there is remarkable unanimity in the results, with the size of benefit of self-monitoring ranging from a 0.16% to 0.39% absolute fall in glycated haemoglobin (HbA1c).

At the end of 2009, the Canadian review indicated that self-monitoring was associated with similarly modest improvements in HbA1c (0.25% fall) among patients with non-insulin treated type 2 diabetes.¹ It also concluded that providing education to help patients translate results from self-monitoring tests into appropriate action did not appear to benefit patients, although only one randomised controlled trial³ assessed this properly. The review found little evidence to suggest that self-monitoring improved health-related quality of life, patient satisfaction, long-term complications or mortality. At the same time a German report also concluded that there is no proof of benefit of blood glucose self-monitoring in patients who are not receiving insulin and that there was no proof of a link between self-monitoring and morbidity and mortality.³ However in July 2009, using the same evidence, the Australian National Health and Medical Research Council concluded that self-monitoring of blood glucose should be considered in all people with type 2 diabetes but suggested that the decision to do it, and the frequency and timing of testing, should be individualised.⁴ Cross-sectional and longitudinal data from participants with type 2 diabetes in an observational, community-based study (Fremantle Diabetes Study) showed neither self-monitoring nor its frequency was associated with glycaemic benefit regardless of treatment.⁵

Most people with medication-treated diabetes, especially insulin users, are encouraged to routinely perform self-monitoring tests 2–4 times a day by diabetes educators and specialists who believe in its value and encourage family doctors to support it. They would argue that special groups such as those newly diagnosed with type 2 diabetes, those who have been doing self-monitoring longer, those who have a high HbA1c or those who have been to an intense education program would benefit from self-monitoring. Unfortunately, the evidence summarised in the Canadian review suggests otherwise.¹ Similarly, a randomised controlled trial from the UK found no statistically significant benefit in people newly diagnosed with type 2 diabetes.⁶ Nevertheless, many diabetes specialists and educators believe self-monitoring complements HbA1c testing and may identify problems with management when HbA1c is not in the target range.

The Canadian review of eight randomised controlled studies, including more than 2400 people, showed no effect of self-monitoring regardless of intensity of education. The analysis

found a mean change in HbA1c of 0.22% for programs where the intensity of education was less or unspecified, compared to 0.28% when the education was more intense. Six studies of patients with an HbA1c of 8–10.5% showed a mean reduction of only 0.3% in HbA1c.

However, another systematic review published about the same time, which included three studies excluded from the Canadian review, appeared to show a trend for a bigger effect in people with a higher HbA1c.⁷ While showing the same overall effect – a reduction in mean HbA1c of 0.24% – this study showed a benefit of 1.23% in mean HbA1c for those with an initial HbA1c over 10%. However, this finding was based on two studies of only 63 people in total.

Frequency of testing

Results of retrospective cohort studies on frequency of glucose self-monitoring were conflicting.¹ However, results from a well-designed randomised controlled trial in people with non-insulin treated diabetes found no statistically significant difference in HbA1c between those who performed self-monitoring of blood glucose once daily and those who performed it four times a day.⁸

Correction
This should read 'and those who performed it four times a week'

Other effects of self-monitoring

The Canadian review also reported that data from randomised controlled trials showed no statistically significant effects of self-monitoring (positive or negative) on body weight, body mass index, hospitalisation, primary care visits, patient satisfaction or patient well-being.¹ While some studies have suggested that increased depression or anxiety may be associated with self-monitoring,⁶ these findings have not so far been confirmed in systematic reviews.¹

Special patient groups

While the overall effect of self-monitoring seems modest, there is a paucity of data on special groups, including heavy goods vehicle drivers for whom hypoglycaemia may pose an unacceptable occupational risk to themselves and the public. Also, people starting or changing their oral diabetes medication may benefit from self-monitoring.

Are there risks to stopping self-monitoring?

While evidence of benefit may be lacking, would abandoning testing in people not on insulin expose them to harm? Overall, there is no evidence that self-monitoring of blood glucose reduces the risk of hypoglycaemia. However, one study⁹ showed a significant increase in risk of hypoglycaemia in people on sulfonylurea-type drugs who did not monitor their own blood glucose. As a guide to the proper use of self-monitoring of blood glucose, the prescriber should ask themselves how the results will change the patient's management. From the patient's perspective, if they are not going to make any

change in behaviour or medication, there seems little sense in undertaking the measurement. From the health professional's perspective, if a change in therapy is based on the HbA1c value, there also seems little point in measuring the blood glucose unless it is to reinforce an educational message or demonstrate the benefit of a change in treatment.

Conclusion

The Canadian review will no doubt generate much discussion. Given the poverty of high quality evidence about how education helps people with diabetes translate results from self-monitoring into effective action to improve their glycaemic control, and the entrenched beliefs of doctors and patient support groups, it will probably require more research in this area before Australian doctors and diabetes educators change their practice.

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Dr Lowe has conducted a drug review for the Canadian Agency for Drugs and Technologies in Health.

Self-test questions

The following statements are either true or false (answers on page 163)

1. Evidence suggests that people who control their diabetes by diet alone still benefit from self-monitoring of blood glucose.
2. Blood glucose self-monitoring may be needed during dose adjustment of oral hypoglycaemic drugs.

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