

# IS SELF-MONITORING OF GLYCAEMIC CONTROL OF ANY VALUE?

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*The author was asked to investigate the prescribing of glucose testing strips by his area prescribing committee. In this article, he presents his findings and some points for discussion*

In my health community area (covering three primary care trusts) we spend more on the prescribing of glucose testing strips (April to September 2001, £279,563) than we do on oral hypoglycaemics (April to September 2001, £223,709). This is also reflected in national figures from the Prescription Pricing Authority. Spend per patient with diabetes varies across the local GP practices by three-fold for blood testing strips and more than five-fold for urine testing strips.

Our area prescribing committee asked me if there was an evidence base to support this level of prescribing. Such prescribing may be appropriate and lead to better management of diabetes patients but it might also be an inappropriate use of resources. If this is so, this resource could be put to better use for the benefit of diabetes patients, for instance, in the increased prescribing of cardiovascular drugs. I present my findings and some points for discussion.

A systematic review was published by the Health Technology Assessment Programme in 2000.<sup>1</sup> Its aim was to evaluate evidence for the clinical and cost-effectiveness of different methods for monitoring blood glucose control in diabetes mellitus. It reported that for self-monitoring in type 2 diabetes, the mean difference in glycated haemoglobin (GHb) between groups performing blood or urine self-monitoring and those not was -0.25 per cent (95 per cent confidence interval, -0.61 to 0.10). The difference in GHb for those performing self-monitoring of blood glucose compared with those urine testing was -0.03 per cent (95 per cent CI, -0.52 to 0.47). The main conclusions from the review were:

- 1 There is no evidence to show that self-monitoring of blood or urine glucose improves blood glucose control measured using GHb or fasting plasma glucose
- 1 The findings support the suggestion that self-monitoring in type 2 diabetes may often be unnecessary

- 1 There is no evidence that blood monitoring is more effective than urine monitoring in improving blood glucose control

- 1 Studies were overall poor, so small but clinically relevant effects might not have been detectable

- 1 Urine testing is less costly than blood testing and preferred by some patients

For self-monitoring in type 1 diabetes it was concluded that a meta-analysis of data from studies that compared blood monitoring with urine monitoring suggested a mean difference in GHb of approximately -0.567 per cent (95 per cent CI, -1.073 to -0.061). This result was of borderline statistical significance. The authors suggest that the studies reviewed do not provide decisive evidence for the clinical effectiveness of self-monitoring of blood glucose in type 1 diabetes. However, because studies were generally neither well conducted nor well reported, and because of low statistical power, the review must be considered to give inconclusive results.

The overall conclusion from the review was that blood glucose self-monitoring is common in clinical practice but the optimal use of the technique has not been established. Present evidence suggests that it may not be essential for all patients.

Some research has been published since the HTA report which potentially adds to the discussion. I attempt to summarise them here.

A study investigated the frequency of self-monitoring of blood glucose and its association with metabolic control and quality of life in type 2 diabetes.<sup>2</sup> The authors concluded that self-monitoring of blood glucose can have an important role in improving metabolic control if it is an inte-

gral part of a wider educational strategy devoted to the promotion of patient autonomy. However, in patients not treated with insulin, self-monitoring is associated with higher (ie, worse) HbA<sub>1c</sub> levels and psychological burden. Self-monitoring of blood glucose of at least once per day was significantly related to higher levels of distress, worries and depressive symptoms among non-insulin-treated patients. In this subgroup, higher scores for diabetes health distress and diabetes-related worries were also significantly related to a monitoring frequency of at least once per week.

On the other hand, the frequency of monitoring was not significantly related to quality of life in insulin-treated subjects. Among insulin-treated patients, the benefit of self-monitoring for metabolic control seemed to be restricted to those who were able to adjust their insulin doses, supporting the concept that self-monitoring is effective only when used for self-management. These results indicate that it seems prudent to recommend self-monitoring to those patients with type 2 diabetes who are able to use the information for their day-to-day glycaemic control to adjust insulin doses and that we do not have evidence to support the extension in the use of this practice to the majority of patients with type 2 diabetes.

A recent paper from the United States<sup>3</sup> concluded that more frequent self-monitoring of blood glucose (assessed from prescription records) was associated with clinically and statistically better glycaemic control regardless of diabetes type or therapy. This was an observational study and the results warrant closer inspection (see Table 1).

Self-monitoring frequency among patients with type 1 diabetes was at least three times daily or, with pharmacologically treated type 2 diabetes, at least daily, as recommended by the American Diabetes Association.

How clinically significant are the differences shown in Table 1, given that none approaches our national target of 7? As the authors say, "it is possible that monitoring

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**TABLE 1: ADJUSTED HbA<sub>1c</sub> LEVELS (95 PER CENT CONFIDENCE INTERVAL) AMONG THOSE WHO ADHERED OR DID NOT ADHERE TO RECOMMENDED SELF-MONITORING GUIDELINES**

	Adherent	Non-adherent	Difference	P value
Type 1	7.7 (7.6, 7.9)	8.7 (8.6, 8.9)	1.0 (0.8, 1.3)	0.0001
Type 2 (insulin)	8.2 (8.2, 8.3)	8.8 (8.8, 8.9)	0.6 (0.5, 0.7)	0.0001
Type 2 (oral agent)	8.1 (8.0, 8.2)	8.7 (8.7, 8.7)	0.6 (0.5, 0.7)	0.0001

frequency is a marker for more intensive diabetes management, which more directly influences glycaemic control<sup>3</sup>.

In the UK Prospective Diabetes Study, the difference in HbA<sub>1c</sub> between the intensively treated group and the control group was 0.9 per cent (7.0 per cent v 7.9 per cent) and this was associated with a 25 per cent relative reduction in risk of microvascular endpoints. The absolute risk reduction was 2.8 microvascular events per 1,000 patient years; in other words, it is necessary to treat 357 patients for one year to prevent one microvascular event.<sup>1</sup> A US study suggests that a sustained reduction in HbA<sub>1c</sub> of at least 1 per cent in adult patients (mean age 60 years) results in cost savings compared with those with less improvement in HbA<sub>1c</sub> levels.<sup>4</sup> Total health care costs were lower by \$685–\$950 per year in the improvers. However, the improvers had a higher baseline HbA<sub>1c</sub> (mean 10.0 per cent v 7.7 per cent) and cost savings were statistically significant only among those with the highest baseline HbA<sub>1c</sub> levels (at least 10 per cent).

What can we distil from all this? In type 1 diabetes, glucose self-monitoring is critical in guiding insulin dosage adjustments. Effective self-monitoring should empower patients to adjust their diet, exercise and medication. As part of a package of care, it may even result in meaningful reductions in HbA<sub>1c</sub> levels. Self-monitoring may also be useful in some patients with type 2 diabetes who use insulin if they are able to adjust their insulin dose or there are concerns about hypoglycaemia.

Equally, evidence suggests that self-monitoring of glucose in many patients with type 2 diabetes using oral hypoglycaemics may not improve HbA<sub>1c</sub> levels at all, may cause distress to the patient, and increase prescribing costs unnecessarily. Regular assessment of HbA<sub>1c</sub> levels may be all that is necessary for medication review and dosage adjustment. The HTA review suggests that four tests per year in subjects with type 1 diabetes and two per year in type 2 diabetes may be appropriate.<sup>1</sup>

A diabetes specialist nurse made some astute observations on this subject back in 1997.<sup>5</sup> She said:

- 1 The inappropriate use of self-monitoring of glucose is wasteful of NHS resources and can cause psychological harm
- 1 Although a few patients find that self-monitoring enables them to understand and take control of their diabetes, many people are performing inaccurate or unnecessary tests
- 1 There is no convincing evidence that self-monitoring improves glycaemic control, or that blood testing is necessarily better than urine testing

1 It may be appropriate for some not to monitor their own glucose but to rely instead on regular laboratory estimations of glycaemic control

- 1 Glucose self-monitoring should be performed only when it serves an identified purpose that is clear to both the patient and the nurse or doctor
- 1 The patient must know why, when, and how to test and how to interpret the results
- 1 Avoiding inappropriate and unnecessary tests will result in enormous cost savings to the NHS as well as increasing the psychological wellbeing of people with diabetes

These are eminently sensible observations but the prescribing data suggest that her colleagues in this field may not have considered them. A survey of some local general practices suggests that up to 85 per cent of patients with type 2 diabetes are receiving prescriptions for blood or urine testing strips. The proportion receiving urine testing strips varies from zero to 50 per cent.

The same nurse<sup>5</sup> made some recommendations for when self-monitoring might be appropriate:

- 1 To provide patients with information about their day-to-day glycaemic control, enabling them to make appropriate adjustments to their diet or medication, especially in relation to their illness, strenuous exercise, or potentially dangerous activities such as driving
- 1 To provide the nurse or doctor with information about day-to-day glycaemic control, enabling them to give appropriate advice, for example, after a raised measurement for GHb
- 1 To detect hypoglycaemia; home monitoring of blood glucose can confirm or rule out hypoglycaemia

There is confusion as to best practice and perhaps we need some national guidance? A telephone call to Diabetes UK elicited the response that it would advise regular testing but without any firm, specific recommendation as to how often this might be. SIGN has recently produced a clinical guideline on the management of diabetes for Scotland.<sup>6</sup> From such a respected organisation one might have expected some firm guidance. However, in a short section 3.2 on self-monitoring, it makes no recommendations at all. It does acknowledge that the literature in this area is difficult to assess.

Difficult or not, it still needs assessing and the best possible recommendation, even of grade D, would be welcome. Otherwise different trusts will make markedly different

decisions — another example of post-code prescribing. The bottom line is that if the current spend on glucose testing strips is inappropriate it could be better spent on the same diabetic patients. There is also concern that the manufacturers of blood glucose testing meters may be contributing to the increased prescribing costs by “loss leading” meters to patients. In my local health community there is eagerness for clarity and consensus and ongoing discussions at the Diabetes Strategy Group are taking place to try and achieve this. Perhaps the second part of the National Service Framework for diabetes or the forthcoming guideline from the National Institute for Clinical Excellence will give us some firm direction? We certainly hope so.

It would be useful for community pharmacists to discuss this issue with their local GP practice to make sure that patients are not given conflicting messages about whether to test or not. How do your patients with diabetes use glucose testing strips? The patients themselves should be involved both in the decision to start self-monitoring and if appropriate, the decision to stop but from an informed point of view.

There is great potential for pharmacists to be involved in motivating and educating people with diabetes about appropriate diet, the benefits of metformin, blood pressure management, demonstrating good technique for testing, how to record, understand, and act on results, and quality control of the strips and machines.

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