

# DRUG UPDATE

No.50

January 2007

## SELF-MONITORING OF BLOOD GLUCOSE

Blood glucose monitoring in patients with type 1 and insulin-treated type 2 diabetes mellitus is recommended as part of an integrated package of self-care. The testing frequency will depend on the patient and their insulin regimen. A frequency of up to four times daily would be recommended. Routine self-monitoring of blood glucose is not required if patients are well controlled on non-insulin therapy, regular HbA<sub>1c</sub> measurement should be used to monitor blood glucose control.

### What is it?

Glucose control can be measured in three ways: blood monitoring, urine monitoring and measurement of glycosylated haemoglobin (HbA<sub>1c</sub>). Blood monitoring, which can be performed by the patient using a blood glucose meter, allows direct measurement of blood glucose, and can identify hypo and hyperglycaemia.<sup>[1]</sup> Urine monitoring measures the level of glucose present in the urine (i.e. excess glucose removed by the kidneys). This type of monitoring is non-invasive, is assessed using visual colour comparisons and can also be performed by the patient. HbA<sub>1c</sub> measurement gives an overall indication of ambient glucose control over the preceding three to four months. This method requires laboratory assessment of a patient's blood sample, collected by a healthcare professional. The aims of treatment in diabetes mellitus (DM) are (a) to adequately control glucose levels thereby minimising microvascular complications and (b) to control blood pressure and cholesterol levels to minimise macrovascular complications.<sup>[2, 3]</sup> Promotion of self-monitoring of blood glucose (SMBG) and increased variety in home testing products (both monitors and test strips) has led to growing concern that inappropriate blood glucose testing results in rising NHS costs and emotional distress for patients.

### Current guidelines and evidence for use

#### Type 1 DM

National Institute for Health and Clinical Excellence (NICE) guidelines recommend that SMBG is used as part of an integrated package of care in patients with type 1 DM.<sup>[2]</sup> Although SMBG itself does not appear to improve glucose control, it is an essential part of the markedly improved outcomes seen in several randomised controlled trials.<sup>[2]</sup> In one clinical trial, adherence to a testing frequency of  $\geq$  three times daily in type 1 DM was associated with significant improvements in HbA<sub>1c</sub> levels.<sup>[4]</sup>

#### Type 2 DM

NICE recommendations state that 'self-monitoring (of glucose) should be taught if the need and / or purpose are clear and agreed with the patient'.<sup>[5]</sup>

A meta-analysis of three trials showed insignificant differences when comparing blood glucose and urine monitoring (HbA<sub>1c</sub> reduction 0.03%, 95% confidence interval

(CI) -0.52 to 0.47%). The same authors also conducted a meta-analysis of four trials and identified a non-significant difference between any monitoring (blood or urine) and no monitoring (HbA<sub>1c</sub> reduction 0.25%, 95% CI -0.61 to 0.10%).<sup>[6]</sup> A recent systematic review of six RCTs demonstrated a nominal but statistically significant reduction in HbA<sub>1c</sub> of 0.39% (95% CI -0.56 to -0.21%) associated with SMBG compared with no additional monitoring.<sup>[7]</sup> However, variations in patient characteristics, interventions and outcomes of these studies could account for this difference. The clinical significance of these results is not clear and current data do not support regular self-monitoring of glucose in non-insulin-treated type 2 DM.

### When should self-monitoring be used?

#### Type 1 and insulin-treated type 2 DM

When insulin therapy is being prescribed blood glucose monitoring is recommended as part of an integrated package of self-care.<sup>[2, 5]</sup> Test frequency will depend on the patient and their insulin regimen:<sup>[2]</sup> a frequency of up to four times daily has been suggested.<sup>[8]</sup> HbA<sub>1c</sub> should be measured every three to six months.<sup>[1]</sup>

#### Non-insulin-treated type 2 DM

Routine SMBG levels is not required if patients are well controlled on non-insulin therapy (including oral treatment, and diet and exercise control).<sup>[8]</sup> Six monthly measurement of HbA<sub>1c</sub> should be used to monitor blood glucose control.<sup>[5]</sup> Patient education should clearly identify potential situations where hypo and hyperglycaemia may arise. Examples of these include:

- Any non-minor illness
- Concomitant systemic steroid therapy
- Initiation of a sulphonylurea

Each patient must be made aware of associated clinical symptoms and appropriate courses of action. There is no clinical trial evidence to suggest that SMBG improves overall blood glucose control, measured by HbA<sub>1c</sub>, in such situations. If patients with non-insulin treated type 2 DM are using SMBG the key questions when doing a medication review should be:

- What action is prompted by the results of SMBG?
- If no action can be taken, what value does self-monitoring add to the patient's care?

## Implications of over-testing

### Cost

In the financial year 2005/2006, 701,000 prescriptions for blood glucose test strips were dispensed in the former Northern and Yorkshire region at a cost of £16.4M. Over the same period, 325,000 prescriptions were dispensed at a cost of £7.2M in Greater Manchester SHA. The equivalent costs for all drugs used in DM were £59.3M and £27.7M, respectively. Thus, blood glucose test strips contributed 27.7% and 26%, respectively, to the total cost of all prescribing for diabetes. A reduction in inappropriate SMBG in patients with DM will release funds which can be reinvested in NHS care.

### Quality of Life

Self-monitoring of glucose levels can be important at diagnosis when used as part of a patient education programme. Understanding the factors affecting glucose control can empower the patient and encourage ownership

of their condition.<sup>[9]</sup> However, it is important in the longer term that the method of glucose monitoring is tailored to the current treatment regimen. Overuse of self-monitoring can be detrimental to patients' quality of life. In one study of almost 3,000 patients SMBG in non-insulin-treated patients was shown to increase distress, worry and depressive symptoms.<sup>[10]</sup>

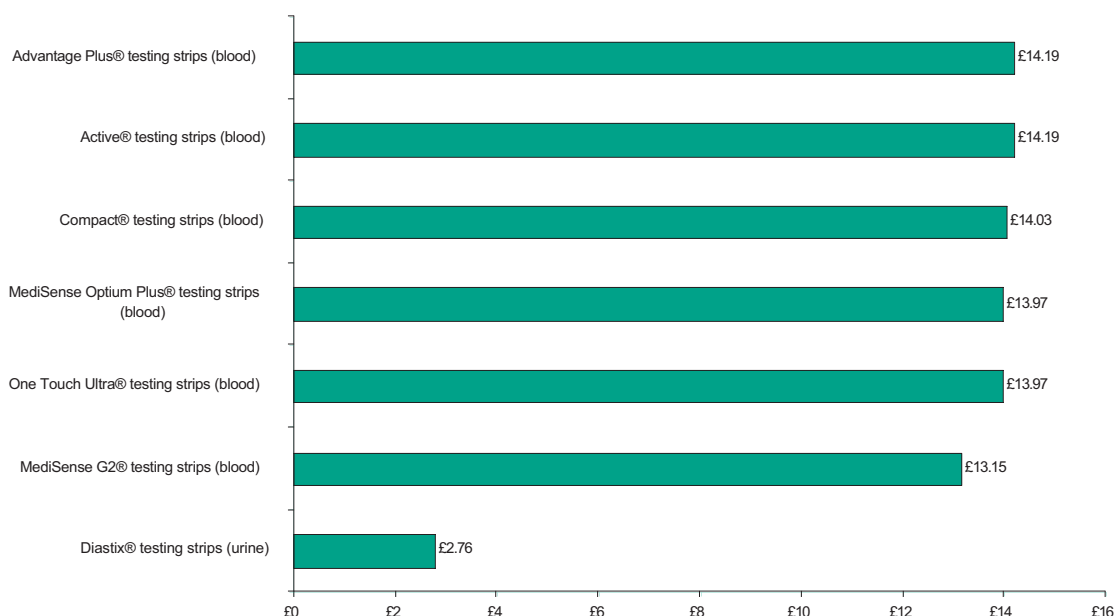
### Implications for practice

Adoption of these recommendations will require revision of prescribing policies and patient education programmes. Overuse of glucose test strips may result from indiscriminate ordering of repeat prescriptions. Methods for tackling this may include:

- Synchronisation of policy across the primary / secondary care interface
- Review of repeat prescription policies (e.g. allowing test strips on acute prescriptions only and issuing minimum quantity required)
- Analysis of waste

### How much does it cost?

Cost of 50 test strips (Drug Tariff January 2007)



N.B. Brands selected were the most commonly prescribed during 2005/06.

## REFERENCES

1. BMA and RPSGB. British National Formulary - Number 52. September 2006.
2. NICE. Type 1 diabetes: diagnosis and management of type 1 diabetes in adults. Clinical Guideline 15; July 2004. (G)
3. NICE. Management of type 2 Diabetes Mellitus: control of blood pressure and lipid levels - inherited clinical guideline. October 2002. (G)
4. Karter AJ et al. Self-monitoring of blood glucose levels and glycaemic control: the Northern California Kaiser Permanente Diabetes registry. Am J Med 2001;111:1-9. (CT)
5. NICE. Management of type 2 diabetes: management of blood glucose - inherited clinical guideline. September 2002. (G)
6. Coster S et al. Monitoring blood glucose control in diabetes mellitus. Health Technol Assess 2000;4:1-93. (MA)
7. Welschen LMC et al. Self-monitoring of blood glucose in patients with type 2 diabetes who are not using insulin. Diabetes Care 2005;28:1510-7. (MA)
8. Owens D et al. Blood glucose self-monitoring in type 1 and type 2 diabetes: reaching a multidisciplinary consensus. Diabetes and Primary Care 2004; 6:8-16. (R)
9. Diabetes UK. Position Statement - Home monitoring of blood glucose levels. July 2003.
10. Franciosi M et al. The impact of blood glucose self-monitoring on metabolic control and quality of life in type 2 diabetic patients: an urgent need for better educational strategies. Diabetes Care 2001;24:1870-7. (CT)

KEY RCT - randomised controlled trial, G- guidelines, MA-meta analysis, R-review, CT – controlled trial

## Regional Drug and Therapeutics Centre

Wolfson Unit, Claremont Place, Newcastle upon Tyne NE2 4HH

Tel: 0191 232 1525 Fax 0191 260 6192

E-mail: [nyrdtc.di@ncl.ac.uk](mailto:nyrdtc.di@ncl.ac.uk) Website: [www.nyrdtc.nhs.uk](http://www.nyrdtc.nhs.uk)

Not to be used for commercial purposes