Enabling effective self-monitoring of blood glucose

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Article points

1. A number of national initiatives highlight the importance of self-monitoring of blood glucose (SMBG) in empowering people to self-manage their diabetes.
2. However, the associated costs, and evidence that many people who self-test subsequently fail to adjust their treatment, have led many primary care trusts to restrict the provision of testing strips, irrespective of clinical need.
3. In order to self-monitor effectively, people with diabetes must receive appropriate training.
4. A collaborative initiative has been designed to improve patient education, provide guidelines and reduce the cost of SMBG in the authors' locality.

Key words

- Blood glucose
- Self-monitoring
- Patient education

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The effectiveness of self-monitoring of blood glucose (SMBG) in people with diabetes has been the subject of much debate; unfortunately, it has been predominantly led by cost rather than clinical need. A number of national organisations support the use of SMBG in order to empower people with diabetes to effectively monitor their condition (National Institute for Health and Clinical Excellence, 2002; Diabetes UK, 2003; National Diabetes Support Team, 2003). However, if empowerment is to be achieved, it is imperative that appropriate training enabling individuals to make the best use of their results is in place. This article describes an initiative to improve patient education, provide guidelines and reduce the cost of SMBG in the authors' locality.

The financial cost of self-monitoring of blood glucose (SMBG) has led to much debate about the value of self-testing in people with diabetes (National Prescribing Centre, 2002; Hearnshaw et al, 2003). Although this debate has focused more on the relevance of SMBG in people with type 2 diabetes, there are many with type 1 diabetes who tend to self-monitor their blood glucose more frequently than those with type 2 diabetes and also fail to adjust their treatment on the basis of the results (Tiley, 2002).

The knee-jerk reaction of many primary care trusts (PCTs) has been to restrict the provision of blood glucose testing strips irrespective of clinical need (Diabetes UK, 2003). This contradicts the recommendations of a number of national organisations, such as the following.

- A National Institute for Health and Clinical Excellence (NICE) guideline recommends that SMBG could 'be used in conjunction with appropriate therapy as part of integrated self-care' (NICE, 2002). Unfortunately, the guideline fails to make any recommendations as to the frequency of monitoring blood glucose.
- The National Diabetes Support Team (2003) supports the recomendation that, if suitable training is offered, there are benefits to be gained from SMBG.
- A position statement from Diabetes UK (2003) emphasises that decisions on whether SMBG should be facilitated in people with diabetes must be based on clinical need and not the associated financial costs.
- Blood glucose consensus guidelines published in 2004 state that self-monitoring empowers people with diabetes to understand glycaemic control, and thereby manage it themselves (Owens et al, 2004).

While there is some evidence to suggest that SMBG can lead to an increase in anxiety,

particularly in people with type 2 diabetes (for example, Peel et al, 2004), this related to a lack of knowledge about the meaning of the results and a sense of failure if blood glucose readings were too high. This may well have been due to the initial training, if any was provided.

Often, patients purchase blood glucose meters from high-street retail outlets. Some of these outlets encourage their staff to teach people with diabetes how to use the meters; however, in the majority of cases this training does not materialise. If it does occur it may be insufficient in terms of the results and their implications, which can lead to anxiety.

In 2004 Western Sussex PCT spent £450 000 on blood glucose testing strips and the acute unit trust spent £15 000 (Western Sussex PCT, 2003; the cost per patient is irrelevant as it depends on the type of diabetes the individual has and the frequency of his/her testing). In response to this, a working party was set up to try to achieve cost savings, particularly in the community spend. The approach taken collaboratively with the PCT and the acute unit trust was as follows.

Materials and methods

A questionnaire was designed to determine current practice with regard to SMBG in people with diabetes (*Appendix 1*). It was distributed via community pharmacists at the point of dispensing blood glucose testing strips. The questionnaires were self-carbonating to allow respondents to take a copy for discussion with their health professional.

A total of 35 local pharmacies participated in the project. Of the 1750 questionnaires distributed, 361 were returned, giving a response rate of 21 %. Of these, 163 were from people with type 1 diabetes and 198 from

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Table 1. A comparison of how many times the questionnaire respondents were instructed to test their blood glucose with how many times they actually tested and how many times they would like to test.

Number of tests per day	Instructed frequency of testing (n)	Usual frequency of testing (n)	Preferred frequency of testing (n)
1	70	81	96
2	67	64	48
3	40	53	37
4	52	51	37
5	2	7	7
6	4	4	2
Total answers received	235	260	227

n=number of respondents

people with type 2 diabetes. Although the return rate was low, type 1 and type 2 diabetes were similarly represented, and the results provided sufficient information to establish current trends for SMBG and served as the basis for developing a series of workshops.

Respondents' ages ranged from 4 to 91 years (mean 65 years). Of all 361 respondents, 34 were treated by diet alone, 164 by oral agents and 163 by insulin.

Results and evaluation

Questionnaire analysis demonstrated that the most frequent monitoring was performed by people with type 1 diabetes, with the majority of respondents with type 1 diabetes testing more than four times a day.

Testing frequency

The respondents were asked how often they were instructed to test their blood glucose, how often they usually tested and how often they would ideally like to test (*Table 1* shows these results). Proportionately more people expressed the desire to test once a day compared with those who actually tested once a day; this suggests a general inclination towards a desire to reduce the number of tests performed per day.

Reasons for testing more frequently than instructed

A large proportion of respondents on insulin increased the frequency of monitoring appropriately in the circumstances shown in *Table 2*. Substantially fewer patients on oral agents tested around exercise than other circumstances; this could possibly be because of a lack of exercise undertaken by this group of people, or a poor understanding of the potential effect of exercise on blood glucose levels.

Time of testing

The majority of respondents tested pre-meal, with significantly less post-meal testing (see *Table 3*); this is almost certainly a reflection on local teaching policy, in that only people with type 1 diabetes on four-times-a-day insulin regimens are encouraged to test postprandially, with those with type 2 diabetes only periodically testing postprandially.

Patient education

One of the most alarming findings was that only 44 respondents, including people with type 1 and 2 diabetes, altered their treatment based on the results of SMBG. In order to address this problem, discussions were held with the local diabetes patient steering group, and an educational approach, as described below, was agreed.

Based on questionnaire analysis, SMBG education workshops were set up. These were held monthly, at various times of the day, for 2 hours. They were advertised in the local

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1. One of the most alarming findings from the questionnaire analysis was that only 44 respondents to the questionnaire altered their treatment based on the results of self-monitoring of blood glucose (SMBG).
2. Based on this, SMBG workshops were set up.

Table 2. Reasons given by respondents for testing more frequently than instructed, and relative frequencies.

Circumstance	Number of people who tested more frequently under the circumstance		
	Those treated with insulin	Those treated with oral agents	Those treated with diet alone
Illness	99	96	12
Exercise	67	36	3
Treatment change	75	71	5

Table 3. Times of day respondents tested their blood glucose.

Before breakfast	After breakfast	Before lunch	After lunch	Before evening meal	After evening meal	Before bed	During the night
332	57	212	62	272	49	215	31

newspaper, local pharmacies, local shops and GP surgeries. Attendance for each workshop, was limited to 20 people because of space restrictions. Carers were also invited. Initially, it was planned to pilot the workshops for 3 months; however, the response has been extremely positive and the workshops have continued to be filled.

People with type 1 and type 2 diabetes attend the workshops; the mix of patients has not been prohibitive to the discussions. Not all patients who attend are self-monitoring their blood glucose; the workshops have given these individuals the opportunity to decide whether it would be appropriate for them.

The workshops are patient-led in terms of content. At the start of each workshop, flip charts are used to take questions; these questions facilitate subsequent discussions around SMBG and other treatment targets. Typically, the following areas are covered:

- the purpose of testing
- factors influencing blood glucose results
- blood glucose meters
- accurate testing
- timing and frequency of testing
- understanding results and making subsequent treatment changes.

Results of patient education

To date, 167 people with diabetes have attended the workshops. Informal feedback taken at the end of each workshop has been very positive. Letters received from attendees have also been very positive:

> *'The workshop helped the discussions regarding difficulties and concerns [and also the sharing of experiences].'*

The workshops are now being formally evaluated by the use of a questionnaire (part one of this was handed out immediately after the workshop; attendees were asked to return part two in the post 1 month later and these were numbered so they could be easily compared with part one) to ascertain their value, and to see whether a change in attendees' understanding and practice surrounding SMBG has taken place. Early indications suggest that a change in patients' practice has occurred and the expenditure on blood glucose monitoring test strips is now reflective of the national trend.

Development of the guidelines

The final part of the initiative was the development of locally agreed guidelines to facilitate appropriate SMBG for people with type 2 diabetes. These have been distributed to all local GP surgeries and pharmacists.

The guidelines were developed by the diabetes nursing team, patients, primary care staff and the prescribing team from the PCT, all of whom contributed to the content and final layout. The aim of the guidelines was to ensure that prescribing of blood glucose monitoring test strips was more appropriate without comprising patients' wishes and clinical needs.

Conclusion

At the time writing the predicted cost savings to Western Sussex PCT were on target for £50 000 to year-end. The diabetes network is now considering how this saving may be re-invested in local diabetes care. This alone suggests that the workshops have had a significant impact in the area. This may well have been achieved by the collaborative approach undertaken by the diabetes centre, the PCT and the active involvement of community pharmacists.

The patient questionnaire provided a useful insight into patients' current practice around blood glucose monitoring: the results suggested a general desire to test less frequently except in those who were only testing once daily, who

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3. The final part of the study was the development of locally agreed guidelines to facilitate appropriate self-monitoring of blood glucose for people with type 2 diabetes. These have been distributed to all local GP surgeries and pharmacists.
4. At the time of writing the predicted cost savings to Western Sussex PCT were on target for £50 000 to year-end.

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1. One of the most alarming findings was that only a small number of patients independently adjusted their treatment based on their blood glucose results; issues such as this were addressed in the workshops.

would, ideally, like to test more frequently; an increase in the frequency of testing was clearly linked to very appropriate reasons for doing so. The majority of respondents tested pre-meal, with occasional postprandial testing; however, this is likely to reflect the small number of people with type 1 diabetes on four-times-a-day regimens included in the analysis. One of the most alarming findings was that only a small number of respondents independently adjusted their treatment based on their results. All of these issues were addressed in the workshops.

This initiative supports patient empowerment in diabetes self-management, in that attendees are given the knowledge, skills, tools and confidence to utilise blood glucose monitoring as part of their diabetes self-management. ■

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1) How is your diabetes treated? Please tick all that apply.

Diet ☐ Tablets ☐ Insulin ☐

2a) How often have you been ***instructed to test*** your blood sugar levels?

How many times per day?		How many times overall per week?	

2b) How often do you ***usually test*** your blood sugar levels?

How many times per day?		How many times overall per week?	

2c) How often ***ideally would you like to test*** your blood sugar levels?

How many times per day?		How many times overall per week?	

3) What reasons make you test more frequently? Please tick all that apply.

Illness ☐ Exercise ☐ Following change in treatment ☐ Other, please specify ☐

4) When do you test your blood sugars? Please tick all the boxes below that apply.

Before breakfast	After breakfast	Before lunch	After lunch	Before evening meal	After evening meal	Before bed	During the night

5) Do you alter your diabetes treatment based on your blood sugars? Please circle YES / NO

Appendix 1. A representation of part of the blood glucose monitoring questionnaire used, the aim of which was to establish the frequency of and the reasons for people self-monitoring their diabetes.

'This initiative supports patient empowerment in diabetes self-management.'