Benefits and Limitations of Home Glucose Monitoring in Type 2 Diabetes

Franciosi M, Pellegrini F, DeBerardis G, 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.

Study Overview

Objective. To determine whether the frequency of self-monitoring of blood glucose (SMBG) in type 2 diabetic patients influences metabolic control and quality of life (QOL).

Design. Cross-sectional study.

Setting and participants. 3567 patients were recruited by 101 outpatient diabetes clinics and 103 general practitioners. Selection of practitioners and practices was based on their willingness to participate. All patients with type 2 diabetes were eligible for inclusion regardless of age, comorbidities, or duration of disease. Subjects completed questionnaires, and clinical information was obtained from patients' providers.

Methods. Data analyses were performed on patients stratified by the number of self-reported SMBG checks performed daily and the diabetic treatment regimen (insulin therapy versus non-insulin therapy). Multilevel logistic regression was applied to account for potential clustering of patients by practice or physician.

Main outcome measures. The primary outcomes were patient scores on QOL instruments and metabolic control. QOL was determined by the Center for Epidemiology Studies depression scale along with multiple questionnaires, which assessed diabetes-related stress, diabetes health distress, and diabetes-related worries. Metabolic control was based on hemoglobin A_{1C} levels. The last reported value from the previous 12 months was used for the analysis.

Main results. 80% of participants (2855/3567) completed responses regarding the frequency of SMBG. The mean age of the cohort was 58.8 years, and 55% were male. 16% (471/2855) of the respondents tested their blood glucose at home 1 or more times daily, 31% (899/2855) tested their blood glucose 1 or more times per week, 15% (414/2855) tested their glucose less than once a week, and 38% (1071/2855) never tested their blood glucose.

On multilevel logistic regression, women (odds ratio [OR], 1.35 [95% confidence interval {CI}, 1.07 to 1.72]), insulin-treated patients (OR, 2.86 [CI, 1.82 to 4.48]), patients experiencing hypoglycemic symptoms (OR, 2.86 [CI, 1.95 to 4.20]), and patients who self-adjusted their insulin doses (OR, 2.31 [CI, 1.47 to 3.64]) were more likely to perform self-monitoring. Patients older than 65 years (OR, 0.71 [CI, 0.53 to 0.96]), patients with less than 5 years' education (OR, 0.63 [CI, 0.49 to 0.81]), and patients treated by general practitioners (OR, 0.60 [CI, 0.41 to 0.87]) were less likely to check their blood glucose.

When patients were stratified by ability to self-adjust insulin doses, a higher frequency of SMBG was associated with better metabolic control ($\beta = -0.55$; $P = 0.015$). Increased frequency of SMBG was not associated with better metabolic control for patients on non-insulin therapies and those who did not self-adjust their insulin therapy. In non-insulin treated patients, after adjusting for patient characteristics, SMBG frequency greater than once a day was associated with higher levels of distress, worries, and depressive symptoms. There was no association between frequency of SMBC monitoring and the QOL measures in insulin treated patients.

Conclusion. SMBG may improve metabolic control, but it is most effective in type 2 diabetics who can self-adjust their insulin therapy. For patients who do not receive insulin, self-monitoring is associated with poorer metabolic control and greater psychological distress.

Commentary

SMBG is generally considered necessary for the appropriate care of diabetic patients requiring insulin [1]. However, how SMBG should be integrated into the care of patients receiving non-insulin therapies is unclear. Franciosi et al have further contributed to this debate with this cross-sectional analysis of a larger, ongoing prospective trial, the Qualità ed Esito in Diabetologia (QuED). Their study reinforces prior literature suggesting that SMBG in non-insulin treated type 2 diabetics may result in higher psychological distress [2]. Practitioners need to be aware of this added potential risk when prescribing SMBG for type 2 diabetes patients on non-insulin therapies. Furthermore, metabolic control was not improved in non-insulin treated patients who frequently monitored their

blood glucose at home. These findings suggest real limitations to the effective use of SMBG.

However, a major limitation of this study is that its cross-sectional design does not allow one to determine the exact relationship between frequency of SMBG and glycemic control. It is plausible that patients were first identified as those with poorly controlled diabetes and, as a result, were instructed to increase their self-monitoring. Hopefully, these relationships might be better answered as the QuED trial progresses.

This study is further limited by a potential selection bias. Practitioners and practices were selected into the study based on their willingness to participate. No information is presented concerning those practitioners who declined to participate in the study, which could limit the generalizability of these findings.

Applications for Clinical Practice

Self-monitoring blood glucose seems to be best tolerated and most effective for patients who are able to adjust their insulin doses based on the results. Although firm conclusions cannot be drawn from this study, the results suggest an increased role for patient autonomy in the management of type 2 diabetes.

–Review by Harvey J. Murff, MD

References

1. American Diabetes Association. Tests of glycemia in diabetes. Diabetes Care 2000;24(Suppl 1):S80–2.
2. Gallichan M. Self monitoring of glucose by people with diabetes: evidence based practice. BMJ 1997;314:964–7.