



Choosing Wisely – 5 Things Physicians & Patients Should Question

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Don't recommend daily home glucose monitoring in patients with Type 2 diabetes mellitus not using insulin.

Self-monitoring of blood glucose (SMBG) is an integral part of patient self-management in maintaining safe and target-driven glucose control in type 1 diabetes mellitus. However, for patients with type 2 diabetes mellitus who are not on insulin or medications associated with hypoglycemia, daily glucose monitoring has been shown to have small statistically significant, but not clinically important, changes in glucose control, and small, but significant, patient harms are associated with daily glucose monitoring. SMBG as part of a structured program of education and medication modification should be reserved for patients during the titration of their medication doses or during periods of changes in patients' diet and exercise routines.

Summary of Update

We searched PubMed, Embase, and Cochrane databases from 2015 to 2022 for systematic reviews and meta-analyses of SMBG in patients with type 2 diabetes mellitus on noninsulin therapies. After screening 246 citations, we found 2 relevant systematic reviews and meta-analyses.^{1,2}

Discussion

SMBG involves intermittent capillary blood monitoring with the use of a glucose meter and specialized testing strips. Newer devices permit continuous glucose monitoring of interstitial glucose levels that are transmitted wirelessly from a sensor device to a monitor. Results from the Diabetes Control and Complications Trial demonstrated the effectiveness of daily SMBG in preventing long-term complications in type 1 diabetes mellitus.^{3,4} Based on these findings, the American Diabetes Association recommends daily frequent monitoring of blood glucose in insulin-requiring patients with type 1 diabetes.⁵

In patients with type 2 diabetes managed with noninsulin therapies or medical nutrition therapy, SMBG is commonly recommended by physicians,⁶ despite the lack of clear evidence linking SMBG to improved glycemic control. Physicians may recommend SMBG to help engage patients when non-insulin therapies

are initiated or modified to better control type 2 diabetes. However, previous research examining the effects of daily finger glucose testing yielded conflicting results.⁷⁻¹¹ A recent meta-analysis of 19 randomized trials of SMBG in patients with type 2 diabetes on non-insulin therapy found a statistically significant, but not clinically meaningful decrease in hemoglobin A1c levels of 0.3% at 6-12 months compared to usual care.¹ Moreover, structured compared to unstructured SMBG also showed small statistically significant differences in hemoglobin A1c (0.2%), and glucose monitoring combined with clinician therapy modification showed a small significant difference in hemoglobin A1c (0.4%) compared to usual care.

Daily glucose testing in type 2 diabetes patients can have important negative consequences. It is burdensome for frail elderly patients, those with cognitive or visual impairment, and those with neurological or musculoskeletal diseases. Studies have shown higher depression scores among patients who monitored daily blood glucose, and concerns by patients that SMBG values are a “proxy of good and bad behavior.”^{12,13} If SMBG data is not used for medication adjustments it can negatively impair adherence and confuse patients about the value of the SMBG.^{13,14}

SMBG also has the unintended consequence of shifting focus away from the more important cardiovascular risk factors such as hypertension and hyperlipidemia. The economic impact of unnecessary testing is large. In 2002, Medicare reported a cost of SMBG in the U.S. as close to \$500 million/year while in other industrialized countries it may account for 10 percent of all spending on diabetes care alone.¹⁵ Cost effectiveness analyses of SMBG in patients with type 2 diabetes not receiving insulin estimate that the incremental cost per quality-adjusted life year is \$113,643.¹⁵⁻¹⁶

Given this updated body of evidence, the American Diabetes Association in its most recent consensus statement highlights the limitations of the evidence to support SMBG in patients with type 2 diabetes who are not on insulin, but does not make a specific recommendation.¹⁷

References

1. Chircop J, Sheffield D, Kotera Y. Systematic Review of Self-Monitoring of Blood Glucose in Patients With Type 2 Diabetes. *Nurs Res.* 2021 Nov-Dec 01;70(6):487-497. doi: 10.1097/NNR.0000000000000542. PMID: 34292228.
2. Zhu H, Zhu Y, Leung S-w. Is self-monitoring of blood glucose effective in improving glycaemic control in type 2 diabetes without insulin treatment: a meta-analysis of randomised controlled trials. *BMJ Open* 2016;6: e010524. doi:10.1136/bmjopen-2015-010524
3. The Diabetes Control and Complications Trial Research Group. The effect of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus. *N Engl J Med* 1993; 329:977.
4. Nathan DM, Cleary PA, Backlund JY, et al. Intensive diabetes treatment and cardiovascular disease in patients with Type 1 diabetes. *N Engl J Med* 2005; 353: 26.

5. American Diabetes Association. Standards of medical care in diabetes. *Diabetes Care* 2013;36 Suppl 1:S11.
6. Pfoh ER, Linfield D, Speaker SL, Roufael JS, Yan C, Misra-Hebert AD, Rothberg MB. Patient Perspectives on Self-Monitoring of Blood Glucose When not Using Insulin: a Cross-sectional Survey. *J Gen Intern Med.* 2022 May;37(7):1673-1679. doi: 10.1007/s11606-021-07047-2.
7. Karter AJ, Parker MM, Moffet HH, et al. Longitudinal study of new and prevalent use of self-monitoring of blood glucose. *Diabetes Care* 2006; 29:1757.
8. Faas A, Schellevis FG, Van Eijk JT. The efficacy of self-monitoring of blood glucose in NIDDM subjects. A criteria-based literature review. *Diabetes Care* 1997; 20:1482.
9. Harris MI, National Health and Nutrition Examination Survey (NHANES III). Frequency of blood glucose monitoring in relation to glycemic control in patients with type 2 diabetes. *Diabetes Care* 2001; 24:979.
10. Davis WA, Bruce DG, Davis TM. Is self-monitoring of blood glucose appropriate for all type 2 diabetic patients? The Fremantle Diabetes Study. *Diabetes Care* 2006; 29:1764.
11. Franciosi M, Pellegrini F, De Berardis G, et al. Self-monitoring of blood glucose in noninsulin-treated diabetic patients: a longitudinal evaluation of its impact on metabolic control. *Diabet Med* 2005; 22:900.
12. O'Kane MJ, Bunting B, Copeland M, et al. Efficacy of self-monitoring of blood glucose in patients with newly diagnosed type 2 diabetes (ESMON study): randomised controlled trial. *BMJ* 2008; 336:1174.
13. Peel E, Douglas M, Lawton J. Self-monitoring of blood glucose in type 2 diabetes: longitudinal qualitative study of patients' perspectives. *BMJ.* 2007; 335: 493.
14. Hou Y-Y, Wei L, Qiu L-B, Wang X-H. Efficacy of blood glucose self-monitoring on glycemic control in patients with non-insulin-treated type 2 diabetes: A meta-analysis. *International Journal of Nursing Sciences* 2014;1(2):191-195.
15. Simon J, Gray A, Clarke P, Wade A, Neil A, Farmer A.: Diabetes Glycaemic Education and Monitoring Trial Group Cost effectiveness of self-monitoring of blood glucose in patients with non-insulin treated type 2 diabetes: economic evaluation of data from the DiGEM trial. *BMJ* 2008; 336: 1177– 1180.
16. Davidson MB.: Counterpoint: self-monitoring of blood glucose in type 2 diabetic patients not receiving insulin: a waste of money. *Diabetes Care* 2005; 28: 1531– 153.
17. Chamberlain JJ, Doyle-Delgado K, Peterson L, Skolnik N. Diabetes Technology: Review of the 2019 American Diabetes Association Standards of Medical Care in Diabetes. *Annals of internal medicine.* 2019;171(6):415-420. doi:10.7326/M19-1638.