

Patient and Physician Management of Self-Monitoring of Blood Glucose: An Iowa Research Network Study

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Self-monitoring of blood glucose (SMBG) has been advocated as an integral part of diabetes care that can reassure and empower patients and improve glycosylated hemoglobin, and has been linked to better outcomes.^{1,2} The purpose of this study was to compare those who conduct SMBG as recommended and those who do not with respect to patient demographics, self-care behaviors, barriers to SMBG, and purchase of blood glucose testing supplies. After institutional review board approval, from four Iowa Research Network rural offices, 48 patients consented to participate and 42 were enrolled in the study, completed a questionnaire, and had medical record and insurance claims reviewed.

Participants' mean age was 55 years, and all were Caucasian. There were no significant differences by age category, gender, marital status, or education when comparing those who test blood glucose less than 90% of the time recommended versus those greater than or equal to 90% of the time recommended or when compared <1 time/day versus \geq 1 time/day. Individuals with higher income were more likely to report testing <90% of the time and to report testing blood glucose <1 time/day (see **Table 1**).

Twenty (49%) participants reported testing their blood glucose one or more times a day, while seven (17%) had their blood glucose tested only when they were at their physician's office. Thirty-five respondents reported a mean satisfaction of 3.31 (on a 1 to 5 scale) with testing their blood glucose, and six were not satisfied with their blood glucose testing. Respondents reported on barriers for SMBG. Being too busy and caring more about other things were the biggest barriers for those not conducting SMBG as recommended (see **Table 1**).

Recommendations for SMBG were not noted in any medical record. Persons with high SMBG adherence were significantly lower in weight and had a lower body mass index (see **Table 1**).

From the insurance data, 14 (33%) subjects did not purchase a glucometer or test strips a year before or after the study consent date. Fifteen (36%) subjects purchased test strips a year before the consent data, and 16 (38%) subjects purchased test strips the year after (some were the same person in each year). Test strips were usually purchased in boxes of 100. For those who purchased test strips, on average, approximately 100 strips were purchased per year.

Based on the insurance data, the subjects (15 subjects the year before study enrollment and 16 the year after) who purchased testing supplies paid a mean co-pay of \$107.00 for their test strips. No significant difference was found between years for the allowed insurance coverage and the patient liability. Persons with high SMBG adherence purchased more test strips over the 2-year period than those with lower adherence (see **Table 1**).

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Abbreviation: (SMBG) self-monitoring of blood glucose

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Table 1.
Participants' Differences Associated with Percentage of Time and Frequency of Testing Blood Glucose^a

	<90% time tested BG as recommended <i>n</i> = 27	≥90 time tested BG as recommended <i>n</i> = 12	Reports test BG <1 time per day <i>n</i> = 21	Reports test BG ≥1 time per day <i>n</i> = 20
Demographic characteristics				
Age				
<50 years	6 (22%)	2 (17%)	5 (24%)	4 (20%)
50–60 years	12 (45%)	6 (50%)	9 (43%)	10 (50%)
>60 years	9 (33%)	4 (33%)	7 (33%)	6 (30%)
Gender				
Male	8 (30%)	6 (50%)	8 (38%)	6 (30%)
Female	19 (70%)	6 (50%)	13 (62%)	14 (70%)
Marital Status				
Never married/divorced	3 (11%)	0	2 (10%)	1 (5%)
Married	24 (89%)	12 (100%)	19 (90%)	19 (95%)
Education				
High school graduate	7 (26%)	4 (34%)	7 (33%)	4 (20%)
Some college	9 (33%)	6 (50%)	7 (33%)	8 (40%)
College graduate	6 (22%)	1 (8%)	3 (15%)	5 (25%)
Graduate degree	5 (19%)	1 (8%)	4 (19%)	3 (15%)
Income				
≤\$50,000	6 (22%) ^b	6 (50%) ^b	3 (14%) ^c	9 (45%) ^c
>\$50,000	21 (78%) ^b	6 (50%) ^b	18 (86%) ^c	11 (55%) ^c
Questionnaire responses				
Years diagnosed diabetes	7.5	7.9	8.1	8.0
Satisfaction SMBG ^d	2.8 ^e	4.5 ^e	2.5 ^f	4.0 ^f
Motivated to test blood glucose ^d	3.7 ^b	4.3 ^b	3.2 ^f	4.1 ^f
Barriers to self-care^d				
Too busy	2.9 ^c	1.1 ^c	2.7	1.8
Cares about other things	1.7 ^b	1.0 ^b	1.5	1.4
Takes effort	2.0	1.3	1.9	1.4
Costs extra money	1.4	1.0	1.4	1.3
Forget to do it	2.8	2.0	2.4	2.5
Hurts	1.6	1.3	1.6	1.3
Depressed or anxious	1.2	1.0	1.1	1.1
Other health problem	1.1	1.0	1.1	1.0
Medical record review				
HbA1c	6.9	6.9	6.8	7.0
Weight	251.4 ^f	206.6 ^f	242.2	230.0
BMI	36.8	32.6	35.2	34.1
Brought BG to office	NS	NS	NS	NS
Physician recommended BG	NS	NS	NS	NS
Insurance data				
Mean test strips purchased year 1	61	163	19 ^f	215 ^f
Mean test strips purchased year 2	89	92	33 ^c	180 ^c
Patient liability for cost test strips year 1	\$26.9	\$46.6	\$10.7 ^c	\$63.6 ^c
Patient liability for cost test strips year 2	\$27.0	\$60.0	\$5.7 ^b	\$72.1 ^b
BG strips paid amount by insurance 1	\$62.1	\$159.0	\$18.1 ^c	\$180.1 ^c
BG strips paid amount by insurance 2	\$54.6	\$264.2	\$12.7 ^b	\$234.6 ^b

^a BG, blood glucose; HbA1c, glycosylated hemoglobin; BMI, body mass index; NS, not significant.

^b *P* < .10.

^c *P* < .05.

^d Several of the questions in the questionnaire were Likert scale. For the satisfaction questions, the scale was 1 = not satisfied to 5 = very satisfied. For the motivation questions, the scale was 1 = not motivated to 5 = extremely motivated. For the barriers to diabetes management questions, the scale was 1 = no problem to 5 = big problem.

^e *P* < .001.

^f *P* < .01.

Education of patients should include blood glucose goals and guidelines for patients to follow regarding adjusting their medication, diet, and exercise. Insurance claims data seems to provide the most accurate available depiction of test strips purchased, followed by subject self-report, and then medical record progress notes.

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