Self-monitoring as an important tool in preventing diabetes complications - Evidence from the real world

Abstract 700 words

Despite the increasing use of Continuous Glucose Monitoring (CGM), Self-Monitoring of Blood Glucose (SMBG), although in use for almost four decades, remains the cornerstone of home and hospital glucose monitoring for majority of diabetes patients worldwide.

As demonstrated in large clinical trials that included SMBG as part of the multifactorial intervention, glycemic control in diabetes remains essential to prevent microvascular complications and reduce long-term risk of macrovascular disease.

For patients on insulin treatment, frequent SMBG is key for achieving recommended glycemic targets, and prevention of hypoglycemia and hyperglycemia.

Increased daily frequency of SMBG in type 1 diabetes patients was significantly associated with lower HbA1c, and with fewer acute complications.

On the other hand, randomized controlled and observational trials in non-insulin treated type 2 diabetes patients on the use of SMBG for improvement of glycemic control and/or reduction of risk for hypoglycemia provided mixed results.

Nevertheless, SMBG remains essential tool of proactive diabetes care approach in these patients, as it provides immediate feedback on glycemic control, rather than waiting months for the next HbA1c (retroactive approach).

SMBG is necessary for education, understanding, and behaviors of non-insulin treated type 2 diabetes patients, and should be individualized in terms of frequency, timing and communication with the healthcare providers, as part of the structured diabetes management.

Recent randomized controlled trial on use of structured SMBG in non-insulin treated type 2 diabetes patients provided mean reduction in HbA1c of 0.9%.

HbA1c is currently recognized as the key surrogate marker for the development of long-term diabetes complications in people with diabetes, and has been used as the primary end point for many studies; however, its numerous limitations (lack of information on acute complications of hypo- and hyperglycemia, and glucose variability; confounded by certain conditions such as anemia, hemoglobinopathies, iron deficiency, and pregnancy), resulted in a need for novel metrics of glucose control (glucometrics), such as Mean Glucose; Time in Range (TIR); Time Above Range (TAR); Time Below Range (TBR); Glucose Management Indicator (GMI); Glycemic Variability (GV); Ambulatory Glucose Profile (AGP).

Although primarily developed for CGM, glucometrics could also be applied for use with SMBG (Mean and Median Glucose; Standard Deviation; % Coefficient of Variation; Interquartile Range, Minimum, Maximum; Glucose Profile by Time of Day and in relation to meals; Glucose by Date;

Percentage of Time (in range, above range, below range); integration with other relevant data, such as insulin dose, medication, meal, exercise).

In addition, analysis of the 7-point SMBG data from the Diabetes Control and Complications Trial (DCCT), demonstrated correlations of TIR with diabetes complications.

Accuracy is crucial for reliable use of SMBG in the real world, and the two most used standards for accuracy of blood glucose monitors are those of the International Organization for Standardization (ISO 15197:2013) and the FDA.

Healthcare providers need to be familiar with the measures of accuracy, such as, bias; precision; arithmetic and absolute deviation; Absolute Relative Difference (ARD) – Mean ARD (MARD) and Median ARD (MedARD); Rectangle Target Plot.

Although healthcare providers and patients assume that regulatory approved blood glucose monitors are accurate, the recent analysis found that only 6 of the top 18 glucose meters met the accuracy standard.

Some of the factors known to affect SMBG accuracy include higher and lower oxygen tension conditions, temperature, interfering substances, manufacturing defects, test strip lot-to-lot variation, alternate site testing, skin contaminants.

Considerable increase in the number of free test strips for type 1 and insulin-treated type 2 diabetes patients was identified as a single most important event that resulted in 10% reduction in cases of diabetic ketoacidosis after 2 years.

Recent real-world studies reported that SMBG is underutilized in patients with type 2 diabetes treated or not with insulin; that postprandial glycaemia is seldom investigated; and poor metabolic control with unsatisfactory rates of hyper- and hypoglycemia were observed.

Unfortunately, there are still countries where SMBG is not available, or is available for minority of patients who mostly perform it once a month, or at no regular interval.

In conclusion, SMBG is not a stand-alone activity; rather a part of a multi-component diabetes care program; and, despite emerging technologies, it is here to stay, as no diabetes management is possible without measurement of glycaemia.

Bio 250 words

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Has served as a Medical Advisor for Diabetes Care to the Minister of Health for 4 years, being WHO NCD and IDF National Contact Person. Had a pivotal role in formation, and serving as a member, of the first National Diabetes Committee, a body for creation and implementation of National Diabetes Policies and Guidelines.

Had a crucial role in creation of Diabetes Care module of the National e-Health System, covering total population of the country across all three healthcare levels (primary, secondary, tertiary), that is still in use.

Author of numerous publications, including the State-of-the-Art article on *Diabetes Care in Republic of Macedonia: Challenges and Opportunities*, first comprehensive overview of the situation with diabetes in the country, estimated to have the second highest diabetes prevalence in Europe, as well as publications on *First Stratified Diabetes Prevalence Data for Republic of Macedonia derived from the National e-Health System,* and *First Metabolic Control Results in Insulin-Treated Diabetes Patients for Republic of Macedonia derived from the National e-Health System.*

Author of a Regional Project awarded Two-year IDF Grant, titled: *Estimation of Stratified Total Diabetes & Pre-Diabetes Prevalence in Western Balkan Countries*.

Member of numerous international and domestic professional associations, and has lectured at various international and domestic diabetes events.

Learning objectives

3-4 learning objectives for your presentation to describe what the audience will learn from your presentation and how they will be able to use this knowledge.

Self-Monitoring of Blood Glucose (SMBG), although in use for almost four decades, remains the cornerstone of home and hospital glucose monitoring for majority of diabetes patients worldwide.

Increased frequency of structured SMBG was associated with lower HbA1c and fewer diabetes complications.

Healthcare providers need to be familiar with measures of SMBG accuracy and novel glucometrics.

Despite demonstrated benefits, recent real-world studies confirm that SMBG is underutilized, and there are still countries where SMBG is not available, or is available for minority of patients.