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Blood Glucose Self-Monitoring in Diabetes: Identifying and Dismantling Barriers to Adherence

Studies have long indicated that maintaining normal glucose levels in patients with diabetes is critical for the prevention of diabetes-related complications. Patients must take an active interest in their own care by following an all-in-one diabetes management plan, the foundation of which is self-monitoring of blood glucose (SMBG). There is considerable evidence that adherence to recommended frequencies of SMBG is far from optimal but a recent survey of patients on insulin therapy has identified key barriers to optimal adherence. Knowing these barriers, diabetes nurse educators may be able to minimize difficulties with SMBG. Educators also need to be familiar with the meters that are available to patients to better tailor their special features to individual patients. Lastly, it is important to remember that patients may forget procedures over time and that educators therefore need to repeat key messages to reinforce the importance of SMBG among insulin users.

It is clearly important to demonstrate to patients with diabetes that good adherence to self-monitoring of blood glucose (SMBG) favourably affects diabetes control. Among the more recent efforts documenting the relationship between frequency of blood glucose monitoring and glycemic control, Evans et al.¹ found a direct relationship between reagent strip uptake and recorded hemoglobin A_{1c} concentrations among patients with type 1 diabetes. A large study involving over 24,000 patients in a managed care organization showed that frequent blood glucose monitoring was associated with clinically and statistically better glycemic control regardless of therapy²—more evidence that SMBG is integral to successful diabetes management. Indeed, adverse glycemic consequences can only be detected, treated and avoided by the use of SMBG and frequent monitoring is particularly critical for patients on flexible-dose insulin who need to know what their glucose levels are prior to injecting insulin.

However, as observed by Nielsen and Christiansen,³ most patients with diabetes do not achieve optimal glycemic control. “Even in highly developed societies, a very large percentage of those with diabetes do not achieve the recommended targets for glycemic control,” they wrote. Studies also indicated that many patients with diabetes either do not monitor their blood glucose levels at all or that adherence to recommended self-care practices is far from optimal. Harris et al.,⁴ for example, found that only 40% of patients with type 1 diabetes monitored their blood glucose at least once a day while only 26% of insulin-using type 2 diabetic patients monitored their blood glucose once a day.

Importantly for diabetes care educators, patients in the Harris et al. study who had attended an education class in diabetes management and who consulted their physicians often for diabetes care were more likely to monitor blood glucose

levels. Scorpiglione et al.⁵ similarly found that out of 1384 insulin-treated patients enrolled from both diabetic outpatient clinics as well as general practitioners’ care, 31% treated with insulin never performed SMBG while only 18.2% monitored their blood glucose with a mean frequency of at least once a day.

In another cross-sectional study involving over 44,000 adults with diabetes, Karter et al.⁶ found that 60% of those with type 1 diabetes practiced SMBG less frequently than recommended by the American Diabetes Association (ADA). The Canadian Diabetes Association (CDA) recommends that the frequency of SMBG should be individualized depending on glycemic control and type of therapy. For individuals with type 1 or type 2 diabetes using insulin, the CDA recommends SMBG as an essential part of diabetes self-management; it should be undertaken at least three times per day and include both pre- and postprandial measurements of blood glucose levels.

Reality of Diabetes Care Survey

A recent attempt to identify reasons for non-adherence to both insulin injection and SMBG was carried out by Ida Wijsman, RN, Diabetes Care Coordinator, Gelre Hospital, Zutphen, The Netherlands, and reported for the first time at the 14th Federation of European Nurses in Diabetes (FEND) annual conference in Vienna in 2009. For the Reality of Diabetes Care survey, Dutch investigators carried out 150 structured telephone interviews in patients on insulin therapy, 59% of whom had type 2 diabetes. Patients were grouped into those who used either “flexible” (41%) or “fixed” dose insulin (59%), the latter defined as patients who indicated that their health care provider defined their daily insulin dose.

Adherence to SMBG was measured by asking participants how many times per day they tested their blood glucose with a blood glucose meter; how many times their health care professional recommended they test their blood sugar each day; and overall, how compliant they were with their health care professional's recommendations about how frequently they tested their blood sugar level.

Non-adherence was defined in three ways. "Self-rated non-adherence" was captured using a self-reported level of adherence on a 7-point scale. Those who scored 5 or lower on this scale were labelled as non-adherent. "Derived non-adherent" combined the total number of patients with self-rated and recommended non-adherence, the latter determined by asking questions about how often the patients tested their blood glucose and how often their health care professionals recommended them to test. The difference between the actual frequency at which patients tested and the recommended frequency showed the level of adherence. For patients on flexible insulin therapy, "guideline non-adherence" was assessed by comparing self-rated daily testing frequency with international guideline recommendations. Patients were then considered non-adherent if they tested less than three times a day, as is currently recommended by the ADA and CDA.^{7,8} Those on fixed insulin dosing were considered compliant if they tested at least once a day.

Overall stated non-adherence to insulin therapy in the Dutch cohort was relatively good at 11%. In contrast, 41% of flexible dose insulin users were categorized as "guideline-non-adherent" to SMBG. In this latter group, 60% of patients measured blood glucose once a day, while 40% measured it twice a day. "Derived non-adherence" to SMBG was 39%.

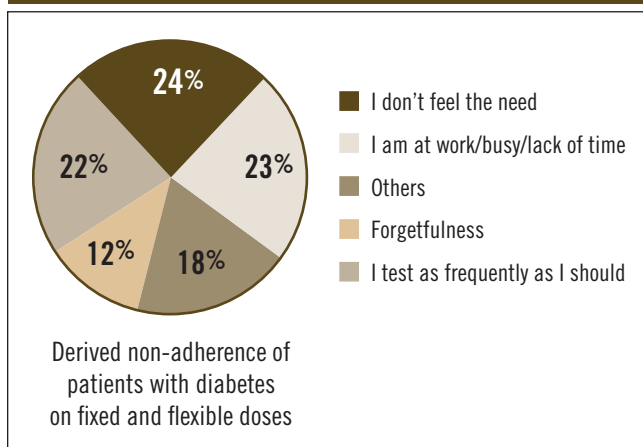
"Sufficient meter testing is an issue among all patients, including those who are compliant," investigators observed. "However, test frequency it is particularly low among non-compliant patients on flexible insulin dosing."

Identifying SMBG Barriers

Several key reasons emerged to explain non-adherence to SMBG, among them lack of awareness as to how frequently patients needed to test blood glucose levels. "Many patients think they are testing as frequently as they should," the authors observed, "but those who acknowledge their infrequent testing tend to reason that they simply don't feel the need or don't have time to test."

Regarding other barriers to SMBG, the authors found that test strip handling issues was the most prevalent problem patients had with SMBG (88%). Specifically, 67% of participants were not aware that test strips could be contaminated by taking them out of their encasing, for example; 20% inappropriately carried test strips that were not stored in a vial; similar numbers did not wash their hands before measuring blood glucose; more than 10% of respondents did not adapt strips and meter to the required temperature or did not close the vial after removing test strips; had dexterity issues such as neuropathy in hands, wrists or fingers that made SMBG difficult; or used expired strips.

Figure 1. What Is the Main Reason You Are Not Able to Test as Frequently as You Should?



Adapted from Wijsman I. FEND 2009, Vienna, Austria.

The most prevalent lifestyle issues that impeded optimal SMBG included trouble testing while on the go (39%); forgetting to test (31%); not having enough time for regular SMBG (23%); not having all the things needed to take a test (21%); finding it cumbersome to carry all the things needed to take a test (21%); and not testing frequently enough because of lack of time (18%) (Figure 1). Pain in turn was cited as a barrier to more frequent blood glucose monitoring by 45% of the cohort; the ability to test discretely by 40%; and issues such as motivation, problems with coding among patients who used a meter which requires coding, safe handling of waste and feeling that testing was unnecessary were cited by between 30% and 40% of survey participants.

Speed and Ease of Use

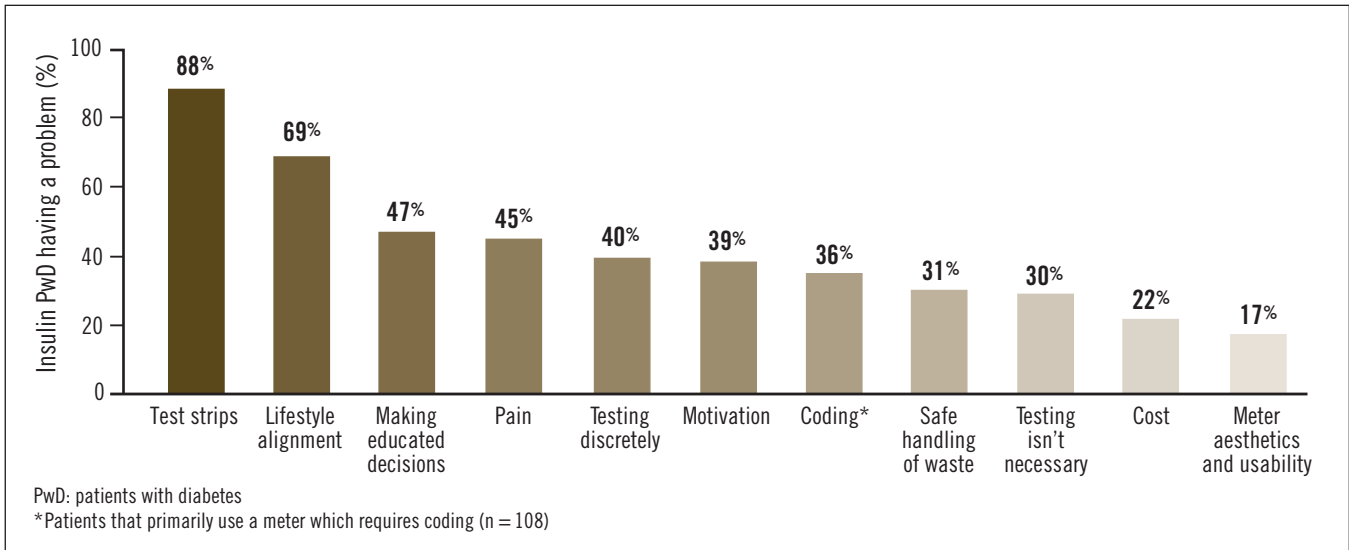
"I know a lot of patients have problems with blood glucose measuring," Wijsman observed during an interview. "I just wasn't sure what the main problems were." For example, she expected meter esthetics to emerge as a significant barrier to SMBG when in effect, it had little impact on adherence rates, cited by only 17% of the group as a barrier to SMBG and cost by only 22% (Figure 2).

As she also observed, many patients with diabetes have told her they need to measure blood glucose "quickly and easily." The fact that so many participants reported having test strip handling issues is a sign that most feel their current SMBG equipment is far from quick and easy to use.

Wijsman was also concerned about the discrepancy between the high degree of patient-reported satisfaction with the knowledge and training they had received from diabetes nurse educators and the relatively low rate at which patients followed educators' advice.

In fact, despite high reported rates of satisfaction with diabetes management and good adherence to insulin therapy, approximately 40% of patients on either fixed or flexible insulin dosing measured their blood glucose less often than recommended by their health care professional or by international guidelines (Figure 3). "For me as a nurse, this was very interesting—patients know how to use the equipment,

Figure 2: Barriers to Blood Glucose Monitoring



Adapted from Wijsman I. FEND 2009, Vienna, Austria.

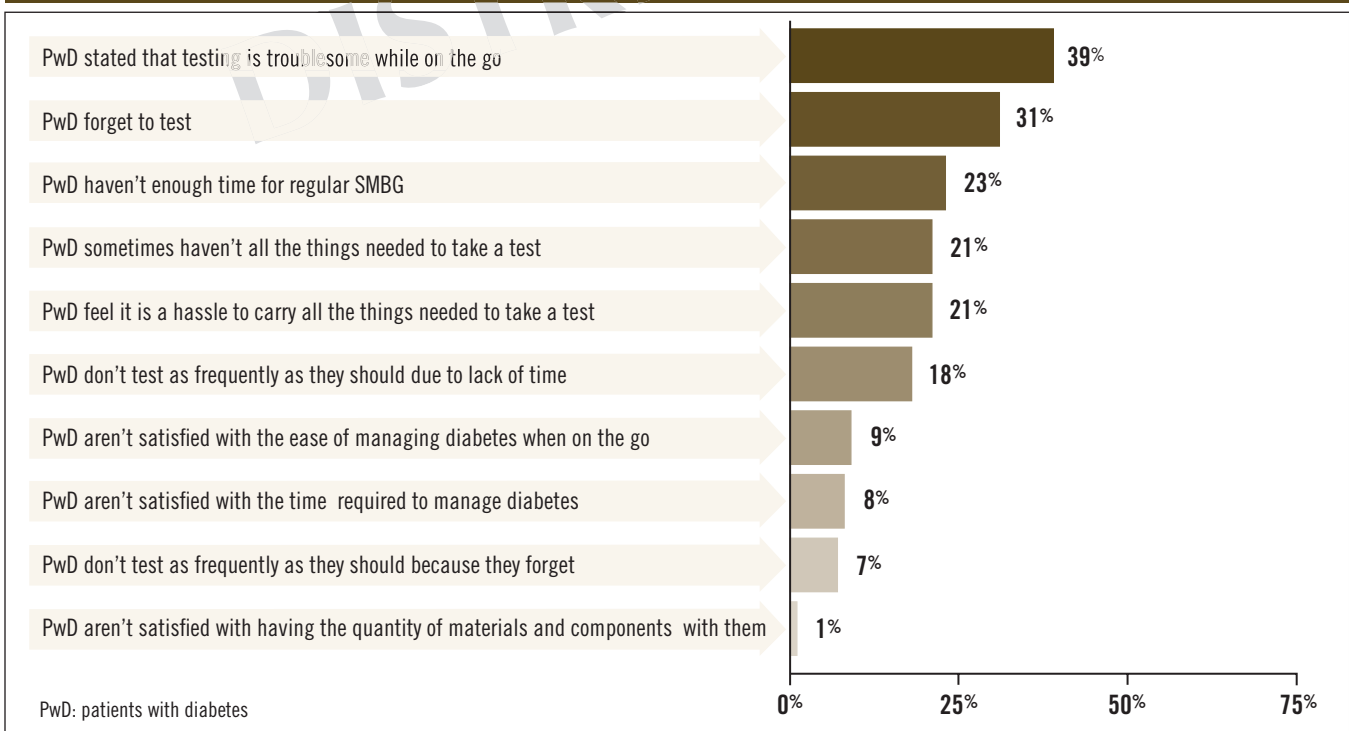
they say everything is good, but when you ask them, ‘are you doing it?’ they do not always do what we ask them to do,” revealed Wijsman.

She and colleagues also noted that the telephone survey method used in this study is likely to have attracted individuals who are more interested in diabetes management than the average patient. As a result, “The sample data may be painting a somewhat more favourable picture regarding patients’ engagement in self-management than it is in reality (as in real-life),” they reported.

Lifestyle Issues

If non-compliance to SMBG in the Dutch cohort was largely driven by lifestyle issues—the perceived hassle of testing, not wanting to test, forgetting to test and not finding enough time to test—then diabetes care educators need to address these issues by identifying ways to minimize them. Patients using a single-strip meter have to handle the strips and the needles and there are a lot of steps involved in SMBG with these meters. An all-in-one meter may eliminate much of the inconvenience

Figure 3. Problems with Lifestyle Alignment



Adapted from Wijsman I. FEND 2009, Vienna, Austria.

of SMBG and make it easier and faster to test while on the go, which may lead to greater adherence.

Another main driver of SMBG non-adherence identified on the survey was patients' lack of knowledge and training about diabetes management: tellingly, dissatisfaction with the amount of knowledge regarding diabetes management stood out as a major barrier to SMBG among non-compliant flexible insulin patients.

"In The Netherlands, there is a clear need for intensified training and motivation for self-management [of diabetes] to reduce existing barriers to SMBG and to increase patient adherence," investigators concluded, "and the selection of the devices for SMBG should also take into account these barriers in order to best support patients in their adherence to recommended therapy."

QUESTIONS AND ANSWERS

Ida Wijsman, RN

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Question: What have you learned from this survey that you feel would be helpful to share with other diabetes nurse educators?

Answer: Diabetes nurse educators always educate patients [about] SMBG but they have to keep repeating key messages because patients forget certain procedures over time. So if you ask patients a few years after they start monitoring blood glucose, they have forgotten some of the steps they need to take and they make mistakes. So repeating educational messages is key.

Secondly, I believe every diabetes nurse educator should know what meters are on the market and their different features. They also need to think about what kind of patient they are treating and the kind of meter that might work best for that patient.

Finally, education is not only about technical issues. Patients who have just been diagnosed with diabetes may be depressed and anxious and you can give them the best meter on the market but if they are under psychological distress, the best meter won't help. So you have to monitor patients for any psychological problems they may be having and address those problems as well.

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