B. McIntosh

The purpose of this qualitative study was to assess beliefs, perceptions and knowledge gaps related to self-monitoring of blood glucose among physicians, pharmacists, diabetes educators and patients with diabetes. This research was conducted as part of a larger CADTH initiative aimed at promoting the optimal use of self-monitoring of blood glucose.

L'objectif de cette étude qualitative était d'évaluer les croyances, les perceptions et les lacunes en matière de connaissances liées à l'autosurveillance de la glycémie parmi les médecins, les pharmaciens, les éducateurs en soins diabétologiques et les personnes atteintes de diabète. Cette recherche a été menée dans le cadre d'une initiative plus large de l'ACMTS visant à faire la promotion d'une utilisation optimale de l'autosurveillance de la glycémie.

Perspectives and experiences of health care professionals and patients with diabetes regarding self-monitoring of blood glucose in Canada

Brendan McIntosh, MSc; Bernard Gauthier, MA; Avtar Lal, MD, PhD; Sumeet R. Singh, BScPhm, MSc; Adil Virani, BScPhm, PharmD, FCSHP

Abstract

Objective: To explore the current perspectives and experiences of Canadian health care professionals and patients with diabetes regarding self-monitoring of blood glucose (SMBG).

Design: Qualitative analysis of focus groups in Ottawa, Vancouver and Edmonton.

Methods: Seventeen focus groups involving 59 health care professionals (19 pharmacists, 18 certified diabetes educators and 22 physicians) and 40 patients with type 1 or type 2 diabetes were held, using separate moderator's guides. Thematic analysis was used to analyze responses.

Results: Health care professionals reported recommending SMBG to most patients with diabetes, regardless of insulin use. They also reported periodically reviewing glucometer results, providing education on interpreting the results and proper use of SMBG devices. The majority of patients with diabetes indicated that they regularly monitored their blood glucose levels and recorded their results. Advantages of SMBG cited by health care professionals included a sense of control over diabetes, the ability to make lifestyle and treatment choices and increased patient confidence. Patients listed expense, discomfort and inconvenience as disadvantages to SMBG. Although patients discussed SMBG readings with their health care professionals, many reported that treating physicians were often uninterested in SMBG results. Physicians tended to refer to SMBG in the context of disease-specific benefits, while certified diabetes educators more often cited the psychological and educational benefits of SMBG. Compared with physicians, pharmacists focused more on the lifestyle and educational benefits of SMBG rather than on changes to medications.

Conclusion: **SMBG is commonly recommended by health care professionals and regularly performed by most patients with diabetes. Pharmacists and other health care professionals play an important role in educating patients on the appropriate use of SMBG and interpretation of results. To ensure optimal use, pharmacists and other health care providers should review the desired outcomes of SMBG with patients on a regular basis.** *Can Pharm J* 2010;143:218-225.

Introduction

Maintaining adequate glycemic control is fundamental to the management of diabetes mellitus. In addition to lifestyle modifications and pharmacotherapy, self-monitoring of blood glucose (SMBG) is recommended as a mechanism for improving glycemic control.[1] The ability of patients to adjust lifestyle and pharmacotherapy in response to blood glucose readings is one of the major cited benefits of self-monitoring.[2,3] While the benefits of SMBG in patients who use insulin are well established, recent systematic reviews have questioned its clinical utility and cost-effectiveness in patients who do not use insulin.[4-7] Nevertheless, SMBG is commonly used in Canada in patients with diabetes, and the majority of costs associated with SMBG are expended on patients not using insulin.[8] Understanding the values, preferences and attitudes of health care professionals and patients with diabetes can provide valuable insights into the rationale for SMBG use and its perceived benefits, which may aid the development of strategies to promote the optimal use of this technology.

Previous qualitative studies of SMBG among physicians and nurses in the United States and United Kingdom have reported that most health care professionals recommend SMBG to patients with type 2 diabetes.[9-11] However, these studies did not conduct detailed investigations on perceptions and practices related to SMBG. Surveys of patients with diabetes, also from the United States and United Kingdom, show that the majority of patients with type 1 or type 2 diabetes perform SMBG;[12-14] however, research is sparse on the factors motivating patients to perform SMBG or the manner in which SMBG results are interpreted and used to modify diet, activity or pharmacotherapy. The attitudes and practices of Canadian health care professionals and patients with diabetes related to SMBG remain unstudied.

In this study, we employed focus groups to

Knowledge into practice

• Nearly all pharmacists, certified diabetes educators and physicians in Canada currently recommend SMBG to their patients with diabetes, and a majority of patients reported compliance with SMBG.

• CADTH has recently issued evidence-based recommendations for the optimal use of SMBG in people with diabetes, and does not advise routine testing for most adults with type 2 diabetes not using insulin, due to the lack of clinically relevant benefits.

• Pharmacists can play an important role in educating patients with diabetes and other health care professionals regarding the effective and efficient use of SMBG.

BOX 1 **Representative quotations from focus group participants**

Are SMBG results reviewed by health care professionals?

• Numbers are important. You ask the patient to test with the glucometer, and it's important that you look at them; to not have feedback would make it a ludicrous exercise … we ask the patient to bring in a log and make comments; it's not just about poking your finger — Physician, Vancouver

• My family doctor only cares about my HbA_{1C} — Patient, Edmonton

Advantages and disadvantages of SMBG

• With self-monitoring, you can know what is going on over the long term — Physician, Edmonton

• I'd like all my diabetic patients to monitor. The costs are an issue, though. These test are very expensive if they aren't covered — Physician, Vancouver

• It's very important. You need to be able to measure the amount of glucose in your blood — Patient, Ottawa

• The cost is fierce. I understood 20 years ago it was a brand new technology, but now it's $1 a strip — Patient, Vancouver

• It hurts. For someone who has to do it several times a day, it can be painful — Patient, Ottawa

What other evidence would you like to see related to SMBG?

• I think that there's evidence that the better control the fewer complications there are; but I'm not sure that there's evidence regarding the advantages of self-monitoring — Physician, Ottawa

• [Evidence regarding] complications and the differences between those who test and those who don't test — Physician, Edmonton

• I have seen first-hand how monitoring works and protects patients, that's all the evidence I need — Certified diabetes educator, Ottawa

• There isn't enough unbiased information. They're all trying to sell you their product. Credible information isn't readily available. You have to do your own due diligence — Patient, Edmonton

HbA_{1C} = hemoglobin A_{1C}; SMBG = self-monitoring of blood glucose.

La connaissance en pratique

• *Au Canada, presque tous les pharmaciens, les éducateurs agréés en soins diabétologiques et les médecins recommandent l'autosurveillance de la glycémie à leurs patients atteints de diabète, et la majorité des patients ont déclaré qu'ils surveillaient leur glycémie.*

• *L'ACMTS a récemment publié des recommandations basées sur des données probantes concernant l'utilisation optimale de l'autosurveillance de la glycémie chez les personnes atteintes de diabète, et ces recommandations ne soutiennent pas les tests de routine pour la plupart des adultes atteints de diabète de type 2 qui ne prennent pas d'insuline, en raison du manque d'avantages cliniques pertinents.*

• *Les pharmaciens peuvent jouer un rôle important dans l'éducation des patients atteints de diabète et auprès des autres professionnels de la santé en regard d'une autosurveillance efficace de la glycémie.*

explore current perspectives, practices and experiences related to SMBG of Canadian health care professionals and patients with type 1 or type 2 diabetes. This research was conducted as part of a larger initiative aimed at optimizing the practice of SMBG (**www.cadth.ca/index.php/en/compus/blood-glucose**).

Methods

A series of 17 focus groups were conducted with pharmacists, certified diabetes educators (CDEs), family physicians or patients with diabetes. It was estimated that including approximately 20 participants from each health care professional group would provide sufficiently representative input from each population. This number was doubled to a target of 40 participants for the patient focus groups to account for the likelihood of greater diversity in this population. The recruitment targets were determined by feasibility, as well as the size of previous qualitative studies of SMBG, some of which enrolled fewer subjects,[11,15,16] and others that were similar in size.[17-19] Representative quotations from patients and health care professionals are presented in Box 1.

A moderator's guide was developed containing a set of questions to probe current practices and attitudes related to SMBG on the part of health care professionals. The questionnaire covered various aspects of SMBG, including the situations and patients for which it was recommended; training provided to patients regarding the use of SMBG and interpretation of results; review of SMBG results with patients; use of results to inform therapeutic decisions; knowledge and views regarding clinical and economic evidence supporting SMBG; advantages and disadvantages of SMBG; and factors in selecting a particular brand of glucometer. A separate moderator's guide was prepared for patients with type 1 and type 2 diabetes mellitus. It explored how patients performed SMBG; who initially recommended the practice; whether education regarding interpretation of glucometer results was received; whether glucometer results were reviewed by health care professionals; common responses to high or low blood glucose readings; and advantages and disadvantages of SMBG.

Samples of health care professionals were selected randomly from commercially available lists of practitioners in 3 Canadian cities (Ottawa, Vancouver and Edmonton). Patients with diabetes were randomly selected from households listed in telephone directories from the same 3 cities. Names on lists thus generated were sorted in alphabetical order, and potential participants were approached in that order until the recruitment quotas were filled for each group. The purpose and conditions of the focus groups were explained to all participants during a telephone screening interview, and verbal consent was secured before the individual was formally invited to the group. Participants signed in for each group, confirming their consent. All personal information was kept confidential at all stages of the research; contact information was used only for the purposes of recruitment. An honorarium was offered to each participant upon completion of each focus group. Focus group sessions of health care professionals and patients were led by the same experienced moderator and lasted approximately 90 minutes. Participant information and proceedings of the focus groups were kept strictly confidential at every stage of the research process.

All focus group sessions were conducted in English, audio-recorded and transcribed for analysis and reporting. A 2-stage thematic approach was used to analyze the data. In the first stage, participant responses were summarized to reflect the prevalence and range of what was said. These findings were organized around the structure of the moderator's guides. Where participants converged or diverged, this was noted, along with the variety of responses elicited. In the second stage, the moderator of the groups reviewed transcripts to identify overarching themes that cut across questions and respondent groups.

A full report of the focus group findings is available at **www.cadth.ca/media/pdf/compus_Current_Practice_Report_Vol-3-Issue-5.pdf**.

Findings

Health care professionals

A total of 19 pharmacists, 18 CDEs and 22 physicians participated in 11 focus groups in the 3 cities. All recruited subjects indicated that they were involved in the care of patients with diabetes. None of the physicians was an endocrinologist or diabetes specialist. Characteristics of the health care professionals sampled are shown in Table 1.

Nearly all participating health care professionals recommended SMBG to the majority of patients with diabetes. Pharmacists and CDEs, in particular, tended to advise all patients with diabetes to use SMBG, whether the disease was controlled with insulin, oral antihyperglycemic agents or lifestyle measures alone. Most expressed the view that it is beneficial for patients to perform SMBG more frequently when they use insulin; are pregnant; are ill; or are undergoing changes in medication, diet or lifestyle. Patients with type 2 diabetes managed with lifestyle and/or oral antihyperglycemic agents with adequate and stable blood glucose levels were identified as a population that may benefit less from SMBG. Pharmacists expressed concern that they may not always have the time required to provide education regarding use of SMBG and interpretation of results, or to review glucometer results with their patients. However, most believed that these activities were important for patients to obtain the benefits of SMBG. Compared with physicians, pharmacists tended to focus more on the lifestyle and educational benefits of SMBG rather than on changes to medications. CDEs stated that they reviewed glucometer results with their patients to adjust therapy, encourage patients to continue testing and create opportunities for learning (e.g., to discuss specific causes of abnormal values). Physicians indicated that they reviewed results from SMBG to monitor their patients' condition and discuss issues related to glycemic control.

Health care professionals reported that the advantages of SMBG to patients were a sense of ownership and control over their disease, enhanced ability to make informed lifestyle choices and increased confidence. Disadvantages included the cost of blood glucose test strips, discomfort and errors or dishonesty in testing or reporting (Table 2).

The responses of health care professionals regarding the available evidence to support use of SMBG were variable. Health care professionals were generally unaware of the recent clinical trials exploring the benefits of SMBG, as well as the information related to costs or cost effectiveness of SMBG. In general, physicians emphasized a need for additional research on the effectiveness of SMBG in reducing long-term complications of diabetes. Pharmacists tended to focus on the need to compare the precision and accuracy of different meters. CDEs demonstrated confidence in the evidence to support SMBG, and tended to cite clinical practice guidelines. None of the health care professional groups demonstrated awareness of recently published large, randomized, controlled trials indicating that SMBG has little utility in patients with

TABLE 1 **Demographics of health care professionals participating in focus groups**

Characteristics	Pharmacists *n* = 19	CDEs *n* = 18	Physicians *n* = 22
City			
Ottawa, *n* (N)	5 (1)	4 (1)	6 (1)
Vancouver, *n* (N)	6 (1)	6 (2)	8 (1)
Edmonton, *n* (N)	8 (1)	8 (2)	8 (1)
Sex			
Male, *n* (%)	5 (26)	0 (0)	14 (64)
Female, *n* (%)	14 (74)	18 (100)	8 (36)
Setting*			
Group practice, *n* (%)	—	—	13 (59)
Solo practice, *n* (%)	—	—	9 (41)
Community pharmacy/care, *n* (%)	8 (42)	7 (39)	—
Retail pharmacy, *n* (%)	11 (58)	—	—
Long-term care centre pharmacy, *n* (%)	5 (26)	—	—
Hospital pharmacy/care, *n* (%)	1 (5)	6 (33)	—
Clinic pharmacy/care, *n* (%)	1 (5)	7 (39)	—
Education			
University, *n* (%)	19 (100)	10 (55)	22 (100)
College or other diploma, *n* (%)	—	8 (45)	—

*Some pharmacists and certified diabetes educators had practices at 2 settings; CDE = certified diabetes educator; *n* = number of participants; N = number of focus groups.

TABLE 2 Summary of advantages and disadvantages of SMBG reported by patients and health care professionals

	Health care professionals	Patients
Advantages	• Sense of ownership and control over disease • Enhanced ability to make informed lifestyle and treatment choices • Increased patient confidence	• Sense of control • Peace of mind • Active management of their diabetes
Disadvantages	• Cost of blood glucose test strips • Discomfort • Errors or dishonesty in testing or reporting of results	• Cost of blood glucose test strips • Discomfort • Inconvenience related to frequent testing • Need to carry required equipment and supplies

SMBG = self-monitoring of blood glucose.

type 2 diabetes who do not use insulin.[20,21]

With respect to receiving additional information on SMBG, most pharmacists stated that publications geared toward their profession would be helpful, and CDEs suggested clinical practice guidelines and conferences as preferred means of learning more about SMBG. Physicians expressed the need for face-to-face learning from other family physicians, endocrinologists or other health care professionals.

Patients

A total of 40 patients with either type 1 or type 2 diabetes mellitus participated in 6 focus groups in the 3 cities. Sixty-five percent of patients were female, and 63% had type 2 diabetes. The demographic characteristics of the patient sample are shown in Table 3.

Most patients reported complying with the advice of their health care professional(s) and stated that they performed SMBG. Patients with type 1 diabetes or those with type 2 diabetes using insulin performed SMBG more frequently than those not using insulin. A majority of participants indicated that they had received sufficient education in performing SMBG and interpreting results. Patients generally recorded results from SMBG in log books or electronic records. Most indicated that they shared their glucometer results with their physicians. However, most patients also reported that their physicians focused more on hemoglobin A_{1C} (HbA_{1C}) levels rather than on glucometer results.

The advantages of SMBG reported by patients included a sense of control, peace of mind and active management of their diabetes. Disadvantages included the cost of blood glucose test strips, discomfort and inconvenience related to frequent testing and the need to carry required equipment and supplies (Table 2).

The majority of patients stated that physicians were the first to motivate them to begin SMBG. Pharmacists and CDEs provided ongoing motivation, helped with selecting a glucometer and provided instructions on appropriate use. With regards to obtaining information on SMBG, patients indicated that their family physician and the Internet were the best sources, and that pharmacists and manufacturers were also useful. A number of patients expressed the need for simpler and more objective information on SMBG.

Discussion

Ours is the first study to explore behaviours, attitudes and perceptions related to SMBG on the part of Canadian patients, pharmacists, CDEs and physicians. We found that Canadian health care professionals who participated in the focus groups recommended SMBG to the majority of their patients. Consistent with this finding, a survey from the United States reported that physicians recommend SMBG to 98% of patients with type 1 or type 2 diabetes,[10] while another survey from the United Kingdom reported that 93% of physicians recommend SMBG to all or most patients with type 2 diabetes.[9]

The majority of patients in this study reported that they followed their health care professional's advice to perform SMBG. This is consistent with 2 surveys of patients from the United Kingdom, one that reported 99% compliance in patients taking insulin, and another that found 79% compliance in patients taking oral antidiabetes agents.[14,19] The majority of participants in our study adjusted medications or lifestyle in response to abnormal glucometer readings (e.g., adjusted insulin, ate, drank water or exercised). Results from previous research on the ability of patients to interpret and act upon SMBG results are somewhat contradictory.[16,22] It is likely that a number of factors

TABLE 3 Demographics of patients with diabetes participating in the focus groups

Characteristics	Patients $n = 40$
City	
Ottawa, n (N)	14 (2)
Vancouver, n (N)	16 (2)
Edmonton, n (N)	10 (2)
Sex	
Male, n (%)	14 (35)
Female, n (%)	26 (65)
Type of diabetes and management option	
Type 1, n (%)	15 (37)
Type 2, n (%)	25 (63)
Insulin	6 (24)
Oral antidiabetes drugs	17 (68)
Diet and or exercise	2 (8)
Duration of diabetes	
<1 year, n (%)	2 (5)
≥1–5 years, n (%)	4 (10)
>5–10 years, n (%)	12 (30)
>10 years, n (%)	22 (55)
Type of work	
Full-time, n (%)	24 (60)
Part-time, n (%)	5 (13)
Working from home, n (%)	4 (10)
Retired, n (%)	7 (18)

n = number of participants; N = number of focus groups.

are involved in patients' ability to interpret SMBG results appropriately, such as education level or the extent to which instructions provided by health care professionals are appropriately tailored to patient needs; therefore, discrepancies across studies in this regard are not surprising.

We found a divergence in the views of health care professionals and patients related to the review of glucometer results. Health care professionals indicated that they reviewed SMBG results with their patients; however, most patients reported that their physician frequently ordered HbA_{1C} testing and made therapeutic decisions based on the HbA_{1C} result rather than on their glucometer readings. These findings are consistent with a previous longitudinal study in patients with type 2 diabetes, in which compliance with SMBG was attenuated over time due to a perceived lack of interest in glucometer results on the part of health care professionals.[16] Initial enthusiasm on the part of physicians regarding SMBG followed by waning

interest in the results may result in confusion for patients regarding the utility of self-monitoring. Periodic review by health care professionals of the need for continuing SMBG and desired goals is therefore necessary.

The advantages and disadvantages of SMBG cited by patients in our study were similar to those reported previously. Past surveys of patients with type 2 diabetes have shown that patients view normal blood glucose readings as a sign of success that offers assurance and comfort, encourages self-regulation and augments patient awareness of lifestyle choices.[16,18] Previous studies are also consistent in terms of the disadvantages of SMBG identified in our focus groups. These included cost, inconvenience, pain, physical difficulty in puncturing site and emotional burden (including anguish, sense of failure with high readings and continuous reminder of disease).[16-18,22-24]

Underlying themes
Analysis of underlying themes across focus groups and questions produced some interesting findings. All respondents referred to SMBG primarily in the context of benefits in terms of disease control, psychological aspects and the role of authoritative advice, although the relative contribution of each of these varied across the groups studied. Pharmacists and physicians tended to refer to SMBG in the context of diabetes control. For example, the benefits of SMBG in terms of controlling blood glucose levels were often cited. In contrast, CDEs focused more on the psychological aspects of SMBG, referring more to patient empowerment, motivation and education. Patients with diabetes differed from health care professionals in the motivating factors for conducting SMBG. They tended to refer to the role that advice from authoritative sources such as health care professionals, friends and family, and the Internet played in their decision-making surrounding performance of SMBG. Differences were also evident in the preferred means of receiving information on SMBG, with pharmacists preferring professional journals, CDEs preferring clinical practice guidelines and conferences, and physicians preferring face-to-face interactions. These differences have implications for the development of strategies to optimize the use of SMBG, in that unique approaches are likely to be required for patients and for different groups of health care professionals.

Limitations
This study had certain limitations that warrant mention. The focus groups included patients with

both type 1 and type 2 diabetes, which limited our ability to draw conclusions for each individual population. As well, medical records of participating patients were not available, precluding the possibility of comparing and correlating the views of patients with their glycemic control. Due to the cross-sectional design of the study, we explored the views of health care professionals and patients only once. Whether practices or views on SMBG change over time could not be explored, and would require a long-term longitudinal study.[16] It is possible that health care professionals and patients who elected to participate in the study are more likely to have an interest in diabetes management; therefore, the results may overestimate their positive attitude toward SMBG. Other differences between the samples studied and the populations from which they were drawn are also possible. A further limitation is that many questions in this study required participants to speculate on the motives and behaviour of other individuals (i.e., physicians interpreting patients' behaviour, or vice versa). Though this projective questioning technique provides valuable insight, it may not accurately predict the motives of another group. Furthermore, discrepancies between how patients perceive the behaviour of their health care professionals and the behaviours reported by health care professionals participating in the focus groups should be interpreted cautiously, since treating physicians were not specifically studied. Further insights may be gained if future studies attempted to match patients and treating physicians. Finally, a possible limitation of focus groups is the potential for one strong voice to influence the responses of other participants. However, compared with surveys or one-on-one interviews, focus groups stimulate discussion and may cause respondents to more critically evaluate their views and experiences.

Implications

The Canadian Agency for Drugs and Technologies in Health recently issued evidence-based recommendations for the optimal use of SMBG in people with diabetes.[25] In adults with type 2 diabetes not using insulin, the routine use of SMBG is not recommended for most patients due to the lack of clinically relevant benefits. Similar recommendations have been issued in Sweden,[26,27] Germany[28] and Scotland.[29] The findings from the current study indicate the widespread belief among health care professionals and patients that SMBG is a cornerstone of diabetes self-management, regardless of the use of insulin. Pharmacists can play an important role in applying the available evidence on SMBG so that maximal benefits are achieved for clients with diabetes.

Conclusion

Before recommending SMBG, health care professionals, in collaboration with patients, need to identify specific goals of self-monitoring and discuss how the results will impact medication and/or lifestyle modifications. Furthermore, the need for ongoing SMBG should be re-evaluated in those not using insulin in light of limited clinical benefits in this population. Educational or other interventions aimed at encouraging the appropriate use of SMBG need to account for differences across health care professional groups and patients in the perceived benefits of SMBG, and preferred venues for receiving information. Pharmacists are well placed to educate patients with diabetes and other health care professionals regarding the effective and efficient use of SMBG. ∎

Canadian Agency for Drugs and Technologies in Health, Ottawa (McIntosh, Lal, Singh); Vision Research Inc., Ottawa (Gauthier); COMPUS Expert Review Committee, Ottawa, Ontario (Virani); Pharmacy Services, Fraser Health Authority, Vancouver (Virani); Faculty of Pharmaceutical Sciences, University of British Columbia, Vancouver, British Columbia (Virani). Contact brendanm@cadth.ca.

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