

Physician Treatment Practices for Patients With Fasting Plasma Glucose Levels Between 6.1 and 6.9 mmol/L

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ABSTRACT

OBJECTIVE

To determine: 1) whether general practitioners (GPs) working in urban private, community or hospital clinics apply the Canadian Diabetes Association (CDA) treatment recommendations for impaired fasting glucose (i.e. diet and exercise modification), and 2) factors associated with these physicians' application of the guidelines (patient/physician characteristics, physician perceptions).

METHOD

GPs in the Montreal area, whose patients had a plasma glucose level between 6.1 and 6.9 mmol/L identified from the CHUM Department of Biochemistry data bank (N=467), were contacted by the Director of Professional Services. Physicians providing written consent were subsequently sent 2 questionnaires by mail: 1 on their patient's diabetes risk factors and treatment, the other on their practice profile

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RÉSUMÉ

OBJECTIF

Déterminer d'abord si les omnipraticiens qui exercent dans des cliniques privées, communautaires ou hospitalières en milieu urbain mettent en pratique les recommandations thérapeutiques de l'Association canadienne du diabète (ACD) en ce qui a trait aux anomalies de la glycémie à jeun (p. ex. modifications de l'alimentation et exercice) et ensuite les facteurs associés à la mise en application des lignes directrices par ces médecins (caractéristiques du patient/du médecin et perceptions du médecin).

MÉTHODE

Le directeur des services professionnels a communiqué avec les omnipraticiens de la région de Montréal qui avaient des patients dont la glycémie se situait entre 6,1 et 6,9 mmol/L selon la banque de données du Département de biochimie du CHUM (n = 467). Les médecins qui avaient donné leur consentement par écrit ont reçu deux questionnaires par la poste, un au sujet des facteurs de risque et du traitement de leurs patients atteints de diabète et l'autre sur le profil de leur exercice (c.-à-d. sexe, nombre de patients atteints de diabète et milieu d'exercice). Les données ont été recueillies avant la publication des Lignes directrices de pratique clinique 2003 de l'ACD.

RÉSULTATS

Des 467 médecins avec qui le directeur des services professionnels avait communiqué, 77 (16 %) ont signalé que leurs patients étaient atteints de diabète ou n'étaient pas à jeun (critères d'exclusion) et 62 (13,3 %) ont rempli le questionnaire sur le profil des patients. Quatre-vingt-un pour cent des répondants ont recommandé que l'hyperglycémie soit traitée. Le traitement recommandé était administré à une clinique en milieu hospitalier (p = 0,009) et à des patients qui présentaient un excès de poids (p = 0,028), une hypertension (p = 0,053) et une hyperlipidémie (p = 0,063).

(i.e. gender, diabetes caseload, practice setting). Data were collected prior to the release of the 2003 CDA guidelines.

RESULTS

Of the 467 physicians contacted, 77 (16%) reported their patients had diabetes or were not fasting (exclusion criteria), and 62 (13.3%) completed the patient profile questionnaire. Eighty-one percent of responding physicians recommended treatment for high blood glucose. Treatment advice was associated with practice setting in a hospital clinic ($p=0.009$), higher patient weight ($p=0.028$), patient hypertension ($p=0.053$) and patient hyperlipidemia ($p=0.063$).

CONCLUSION

The majority of GPs who responded to our survey applied the CDA treatment guidelines for high blood glucose. Treatment advice was associated with both physician and patient characteristics.

INTRODUCTION

Results of recent diabetes prevention studies reinforce the need for intensive management to delay onset of type 2 diabetes (1-4). Lifestyle modification has been recommended for individuals with impaired fasting glucose (IFG) by both the Canadian Diabetes Association (CDA) and American Diabetes Association (ADA) for >10 years (5-10), yet little is known about whether or not physicians actually recommend lifestyle changes to patients and what factors are associated with physician treatment practices. The 1998 CDA clinical practice guidelines recommended nutrition therapy, weight loss, glucose monitoring and pharmacological therapy for individuals with high blood glucose (BG) levels (5), and the 2003 guidelines recommend more aggressive treatment for IFG (6). Similarly, the ADA suggests that lifestyle modification, particularly weight loss and physical activity, should be the focus of prevention or delay of diabetes (7-8). The problems of IFG and impaired glucose tolerance (IGT) are clinically significant, since they are often an intermediate stage in the development of diabetes (i.e. prediabetes) and are associated with insulin resistance, compensatory hyperinsulinemia to maintain glucose homeostasis, obesity (in particular abdominal or visceral obesity), elevated triglycerides, decreased high-density lipoprotein cholesterol (HDL-C) and hypertension (10).

The high prevalence of undiagnosed diabetes and the growing epidemic of diabetes in children are underlying forces that drive the medical community to screen for diabetes and institute treatment for prediabetes (11-14). However, professional organizations have not taken a unified position regarding detection/screening for diabetes or treatment for IFG (6,9,15,16). The CDA and ADA recommend that screening for diabetes be performed every 3 years among individuals >45 years of age, particularly those with a body mass index (BMI) ≥ 25 kg/m² (5,6,9,10). More

CONCLUSION

La majorité des médecins qui ont répondu à nos questionnaires mettent en application les lignes directrices de l'ACD au sujet du traitement de l'hyperglycémie. Les recommandations thérapeutiques étaient associées aux caractéristiques du médecin et du patient.

frequent testing should be conducted among those with additional risk factors. In contrast, the United States Preventive Services Task Force (USPSTF) recommends that only patients with high blood pressure (BP) or hypercholesterolemia be screened (15,16). Treatment of IFG also remains controversial. Recent trials have shown that lifestyle intervention among individuals with IGT can decrease the risk of developing type 2 diabetes by over 50% (1-4) and that tight BG control can delay the onset and slow the progression of microvascular complications by 25 to 75% (17-19). However, the USPSTF (15,16) states that there is insufficient evidence to support treating asymptomatic patients to lower BG. The problem is complex and multifactorial, and may present a challenge for physicians when making treatment decisions.

Physician treatment practices are influenced by the severity of a patient's condition and physician characteristics, including years of experience, specialty, patient caseload and hospital affiliation (20-22). These issues have been studied in diabetes (23-28), however no studies have specifically focused on physician treatment practices for individuals in the prediabetes phase.

Our study objectives were to determine: 1) whether physicians apply treatment recommendations (i.e. diet and exercise modification) for IFG according to the CDA clinical practice guidelines and 2) factors associated with physicians' application of the guidelines (i.e. patient characteristics, physician characteristics and physician perceptions). We hypothesized that the following characteristics would be associated with physicians recommending lifestyle modifications to their patients with BG levels between 6.1 and 6.9 mmol/L: patients with a higher BMI, patients with a higher number of risk factors, physicians who treat more patients with diabetes, physicians practicing in a hospital setting and physicians with more positive perceptions about the benefits of early treatment.

METHODS

Physicians whose patients had a plasma glucose (PG) level between 6.1 and 6.9 mmol/L were identified from the data bank of the Department of Biochemistry of CHUM (Université de Montréal Hospital Centre: Notre-Dame, Hôtel-Dieu and St-Luc hospitals). The 3 hospitals serve numerous clinics in the surrounding Montreal area. Patients with a PG level between 6.1 and 6.9 mmol/L and whose PG tests were taken between 6:00 AM and 12:00 PM were eligible for inclusion. Exclusion criteria included: hospitalized patients, analyses requested by specialists, analyses requested by specialty clinics, patients with diabetes (as reported by physicians) and nonfasting values (as reported by physicians).

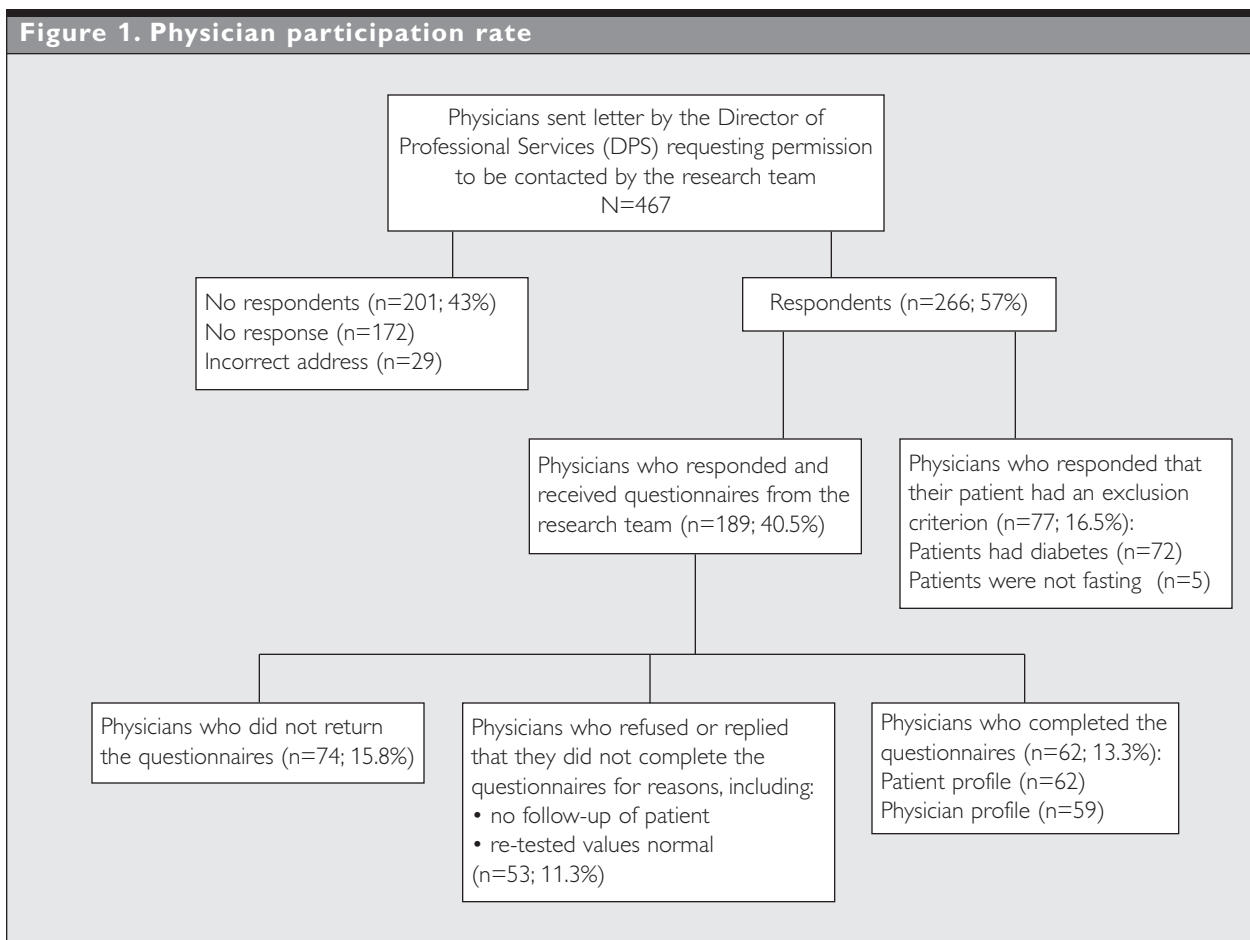
All laboratory records, during a 1-year period (2000 to 2001), were reviewed to identify eligible patients. The physician responsible was then identified for that patient. If the physician was a general practitioner (GP) and was not previously identified, he/she was enrolled in the study. After going through this process every 2 weeks for a 1-year period, a total of 467 physicians were identified (1 patient per physician). All data were collected prior to the release of the 2003 CDA clinical practice guidelines.

The Director of Professional Services of the CHUM contacted, by post, the 467 GPs who had requested the BG tests,

~6 months after the blood test. The research team were blinded to the names of patients and physicians. In this initial letter, the study context was briefly described and physicians were asked for their permission to be contacted by the research team to explain the study in further detail. Those who provided written consent were subsequently sent a letter from the research team describing the study. Physicians were asked to complete and return 2 mail-in questionnaires: the first asked for information about patient case diabetes risk factors and treatment for high BG, and the second asked for information about the physician medical practice profile. Physicians were also asked to provide permission for a chart review. Self-addressed stamped return envelopes were provided; no other form of compensation was given to physicians. The study, similar to a chart review study, was approved by the Director of Professional Services and the Ethics Committee of CHUM, as well as the Quebec College of Physicians (Collège des médecins du Québec). Physicians were informed that information pertaining to their individual treatment practices would not be divulged to the Quebec College of Physicians and results would be reported as a summary of all physician responses.

Questions related to the patient's profile included: diagnosis of IFG or IGT, treatment for hyperglycemia (multiple

Figure 1. Physician participation rate



choice response that included: no treatment, diet advice, weight loss advice, referral to a dietitian, BG monitoring, other), hyperlipidemia (multiple choice response that included: diet, medication, other), hypertension (multiple choice response that included: diet, medication, other), cardiovascular disease (CVD) (multiple choice response that included: diet, medication, other), family history of diabetes, history of gestational diabetes or baby weighing >4 kg, high-risk ethnic population, height, weight, alcohol use, tobacco use and physical activity. Questions related to physician practice profile included:

gender, years since obtaining MD diploma, patient caseload for diabetes, practice setting (hospital clinic, private clinic, community clinic (in Quebec these are known as Centres locaux de services communautaires [CLSC], home visit, etc), practice time (percentage of time spent for: clinical, research, teaching responsibilities, etc). Physicians were also asked to rate their perceptions regarding benefits of early treatment and asked to respond to the following statement: "Early treatment of patients with IFG will reduce complications in the long term." Responses were rated on a Likert-scale ranging from

Table 1. Patient characteristics for the total sample and those with and without treatment for BG

| Variables | Total # of patients (N=62*) | Treatment reported for BG (n=50*) | | No treatment reported for BG (n=12*) | | p |
|---|-----------------------------|-----------------------------------|-----|--------------------------------------|----|-------|
| | | n | % | n | % | |
| Hyperlipidemia (n=59)* | | | | | | |
| Yes | 41 | 36 | 88 | 5 | 12 | 0.063 |
| No | 18 | 12 | 67 | 6 | 33 | |
| Hypertension | | | | | | |
| Yes | 31 | 28 | 90 | 3 | 10 | 0.053 |
| No | 31 | 22 | 71 | 9 | 29 | |
| CVD (n=61)* | | | | | | |
| Yes | 9 | 8 | 89 | 1 | 11 | 0.431 |
| No | 52 | 41 | 79 | 11 | 21 | |
| Family history of diabetes (n=38)* | | | | | | |
| Yes | 13 | 11 | 85 | 2 | 15 | 0.549 |
| No | 25 | 20 | 80 | 5 | 20 | |
| High-risk population | | | | | | |
| Yes | 6 | 6 | 100 | 0 | 0 | 0.258 |
| No | 56 | 44 | 79 | 12 | 21 | |
| Tobacco use (n=57)* | | | | | | |
| Yes | 10 | 8 | 80 | 2 | 20 | 0.625 |
| No | 47 | 40 | 85 | 7 | 15 | |
| Alcohol use (n=56)* | | | | | | |
| Yes | 28 | 25 | 89 | 3 | 11 | 0.234 |
| No | 28 | 22 | 79 | 6 | 21 | |
| Physical activity (n=51)* | | | | | | |
| Yes | 23 | 20 | 87 | 3 | 13 | 0.613 |
| No | 28 | 24 | 86 | 4 | 14 | |
| Age, years (mean±SD) (n=61)* | 60.8±4.4 | 61.5±13.4 | | 58.1±18.2 | | 0.467 |
| Weight, kg (mean±SD) (n=56)* | 77.9±16.9 | 80.5±16.8 | | 68.4±14.6 | | 0.028 |
| BMI, kg/m ² (mean±SD) (n=37)* | 29.5±7.1 | 30.6±7.2 | | 25.6±5.3 | | 0.079 |
| Number of risk factors† (mean±SD) (n=26)* | 3.6±1.2 | 3.7±1.2 | | 3.2±1.3 | | 0.387 |

*Some questions were not answered by all physicians. Thus, where indicated, the n patient variables is <62

†Sum of risk factors (hyperlipidemia, hypertension, CVD, BMI and family history of diabetes)

p = significance of differences between patient characteristics for those who received treatment and those who did not.

BG = blood glucose

BMI = body mass index

CVD = cardiovascular disease

SD = standard deviation

1 (strongly disagree) to 7 (strongly agree) and were categorized for analyses. Physicians were also asked the level of fasting PG at which they usually initiate a nonpharmacological treatment (i.e. lifestyle modification).

Statistical analyses

The SPSS program was used to conduct analyses (SPSS statistical analysis, Chicago, Illinois, 1990). Descriptive statistics were used to describe patient and physician characteristics. Fisher's exact test, 1-tailed test (for categorical variables) and t-test (for continuous variables) were used to determine the significance of differences between patients who received treatment for their BG levels and those who did not.

RESULTS

Participation rate

Figure 1 summarizes the participation rate of the physicians contacted for this study. Of the 467 physicians contacted by the Director of Professional Services of CHUM, 201 (43.3%; 172 no response, 29 wrong address) did not respond to the initial letter. Among the 266 (57%) respondents, 77 (16.5%) reported that their patients had exclusion criteria, and the remaining 189 (40.5%) responded that they were willing to be contacted by the research team. Of these respondents,

62 completed the patient profile questionnaire; 59 completed the physician profile questionnaire.

Sixty percent of physicians (37/62) who completed the questionnaires gave permission to conduct a chart review. In order to compare self-reported behaviour with actual practice, 4 patients charts, randomly selected, were compared with the corresponding physician's questionnaire (no review was conducted on the other 33 charts). In this limited subsample, an estimated 91% agreement was found between the physician questionnaire and information provided in the chart.

Patient and physician characteristics

Patient and physician characteristics are outlined in Tables 1 and 2, respectively. Sixty-nine percent of patients had hyperlipidemia, 50% had hypertension, 15% had CVD, 34% had a known family history of diabetes and 10% were from a high-risk ethnic population (African, Asiatic, Hispanic or Aboriginal origin). Only 18% were reported as smokers, a low percentage compared with the Quebec adult population (29). Fifty-three percent of physician respondents were female, 54% had obtained their MD diploma more than 20 years ago, 31% had a caseload of more than 10 patients with diabetes per week, 38% practiced at a hospital clinic, and 66% devoted all their practice time to clinical duties.

Table 2. Physician characteristics in relation to patient treatment for BG

| Variables | Number of physician respondents (N=59) | Treatment reported for BG (n=48*) | | No treatment reported for BG (n=11*) | | p |
|---|--|-----------------------------------|-----|--------------------------------------|----|-------|
| | | n | % | n | % | |
| Gender | | | | | | |
| Female | 31 | 28 | 90 | 3 | 10 | 0.187 |
| Male | 28 | 22 | 79 | 6 | 21 | |
| Years since MD diploma | | | | | | |
| <20 years | 27 | 25 | 93 | 2 | 7 | 0.119 |
| ≥20 years | 32 | 25 | 78 | 7 | 22 | |
| Diabetes patient caseload | | | | | | |
| <10/week | 41 | 37 | 90 | 4 | 10 | 0.087 |
| ≥10/week | 18 | 13 | 72 | 5 | 28 | |
| Physician practice setting (n=58)* | | | | | | |
| Hospital clinic | 22 | 22 | 100 | 0 | 0 | 0.009 |
| Private clinic only, CLSC | 36 | 27 | 75 | 9 | 25 | |
| Physician % practice time | | | | | | |
| Clinic only | 39 | 31 | 80 | 8 | 20 | 0.115 |
| Clinic plus teaching/research | 20 | 19 | 95 | 1 | 5 | |
| Physician perceptions regarding benefits of early treatment (n=58)* | | | | | | |
| Agree strongly | 36 | 30 | 83 | 6 | 17 | 0.534 |
| Agree moderately/other | 22 | 19 | 86 | 3 | 14 | |

*Some questions were not answered by all physicians; therefore, where indicated, n=<59

p = significance of differences between physicians characteristics for those who provided treatment and those who did not

BG = blood glucose

CLSC = Centres locaux de services communautaires

Physicians' views

In response to the question regarding the level of BG at which physicians usually initiate nonpharmacological treatment, 40/59 (68%) responded between 6.0 and 7.0 mmol/L and 16/59 (27%) responded >7.0 mmol/L. Physicians' responses to the question regarding benefits of early treatment were as follows: 62% (36/58) strongly agreed with the statement, 19% (11/58) moderately agreed, 12% (7/58) slightly agreed, 5% (3/58) were neutral and 2% (1/58) strongly disagreed.

Treatment practices

Of the 62 physicians who completed the questionnaires, 30 (48%) reported that their patients had IFG, 17 (27%) that they had IGT and 15 (24%) did not report a diagnosis of IFG or IGT. Treatment advice for high BG was provided to 23, 16 and 11 patients, respectively, for a total of 50 (81%) patients. These treatments consisted of diet advice alone (22/50), diet/weight loss and/or exercise advice (19/50), and diet with glucose-lowering medication (1/50). Six patients were referred to a dietitian, 1 was referred to a diabetes centre and 1 refused treatment. Forty-three of the 50 (86%) patients who received treatment advice for high BG levels also received treatment for high BP and/or hyperlipidemia. Twelve (12/62; 19%) patients were not given any advice or treatment, but 3 of the 12 physicians specified that they would retest BG level.

Factors associated with treatment advice

Treatment advice for high BG (6.1 to 6.9 mmol/L) was associated with physicians practicing in a hospital clinic setting ($p=0.009$), higher patient weight ($p=0.028$), patient hypertension ($p=0.053$) and patient hyperlipidemia ($p=0.063$). Other patient and physician characteristics as well as physician perceptions regarding benefits of early treatment were not associated with treatment advice (Table 1 and Table 2).

DISCUSSION

Overall, 13% (62/467) of contacted physicians responded to the questionnaires. Because of the nature of the study design and confidentiality issues, it was not possible to compare responding and nonresponding physicians. However, characteristics of responding physicians were compared with statistics available from the Quebec College of Physicians (30). In our study, 53% of GP respondents were women, compared with 40% of GPs in the Montreal region; 46% of physicians had received their MD diploma <20 years ago. Our group was probably younger than that of GPs in the Montreal area (30). Furthermore, our responding physicians are likely different from those in the DIASCAN study of Canadian family physicians, as these consisted of a stratified random sample of family physicians across Canada (241/400, 60% participation rate) (13). Physician age and years in practice has been found to be associated with physician care practices in diabetes (25,28), but no information is available for prediabetes.

When physicians were asked at what level of fasting PG they usually initiate nonpharmacological treatment, 32% responded ≥ 7.0 mmol/L, a value that exceeds the 6.1 to 6.9 mmol/L recommended in the CDA clinical practice guidelines. But according to the patient profile questionnaire, 19% of physicians did not provide any treatment advice, as recommended by the CDA. The discrepancy may be explained by the confounding effect of treatments for high BP and hyperlipidemia, which were associated with treatment of hyperglycemia.

Thus, 81% of responding GPs applied the CDA treatment guidelines for IFG and did recommend lifestyle modifications. Physicians took time to address lifestyle changes in the office-based setting, despite the limited time frame and competing medical conditions. The intensity of the dietary and weight loss advice provided is unknown. Lifestyle modification requires regular reinforcement and frequent monitoring if patients are to succeed in achieving and maintaining change (31). Only very few patients were referred to a dietitian or diabetes centre for counselling.

In this study, we report a high percentage of responding physicians (81%) who provided treatment advice for prediabetes. This is higher than our findings in another study (32) we conducted among participants of the Santé Québec Health Survey, who had 2 or more risk factors for diabetes. In the Santé Québec data study (32), when we examined information provided by physicians alone (not including patient information) we found that only 48% of responding physicians reported providing treatment advice. Differences in results may be due to the different study methodologies or to the bias in the profile of responding physicians. In this present study, in which our request for participation originated from the Director of Professional Services and not from the patient, overall 30% of physicians responded. In our Santé Québec data study, in which patients provided written permission to contact their physician to complete a questionnaire, approximately 50% of physicians responded to our questionnaire. We had a lower participation rate in this present study. If one speculates that nonresponding physicians do not provide treatment advice, then our treatment rates may be more similar than different.

As expected, physician treatment practices for high BG (6.1 to 6.9 mmol/L) were found to be associated with higher patient body weight, patient hypertension and patient hyperlipidemia. Contrary to our hypothesis, the type of risk factor rather than the total number of risk factors was associated with treatment practices. This is consistent with the emphasis placed on hypercholesterolemia and hypertension by the USPSTF (15,16). Physician characteristics were also found to be significantly associated with treatment practices. All physicians who practiced in a hospital clinic reported treating high BG. This may be due to the fact that they are exposed to greater disease severity in their caseloads or have easier access to a larger breadth of medical literature on the subject. Continuing medical education programs that target physicians who do not practice in a hospital setting should be considered.

Approximately 1 in 5 physicians reported not providing lifestyle treatment for their patient's with BG levels between 6.1 and 6.9 mmol/L. Physicians may be concerned with the poor rates of patient compliance with lifestyle changes and question the utility of their interventions among certain patients. However, physician messages and patient involvement are powerful tools in influencing positive lifestyle changes (33-36) and continuing medical education should emphasize this point as an effective early preventive measure.

Our low response rate to the questionnaires is an important study limitation. Furthermore, as previously stated, responding physicians may be different from nonresponding physicians, and our results may be biased towards physicians who know the guidelines and approve of them.

CONCLUSION

Over 80% of a group of GPs who were surveyed using a questionnaire applied the Canadian Diabetes Association clinical practice guidelines for IFG and recommended lifestyle modifications. Applications of the guidelines occurred more frequently among physicians who practiced in the hospital setting and those whose patients had higher weight, hypertension and hyperlipidemia.

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AUTHOR DISCLOSURES

No duality of interest declared.

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