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Compliance of rural and urban family physicians with clinical practice guidelines for non-insulin-dependent diabetes: a comparison

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Abstract

Objectives and method: To compare rural and urban family physicians' compliance with the Canadian Diabetes Association (CDA) guidelines for the care of patients with non-insulin-dependent diabetes mellitus (NIDDM). To compare blood sugar control levels in patients with NIDDM being cared for by rural or urban family physicians, using levels of glycosylated hemoglobin (HbA1C) as a surrogate measure of glycemic control.

A retrospective medical chart audit was undertaken. With standardized forms based on the CDA guidelines, information about blood sugar and lipid level control, presence of diabetes complications and physician management parameters was extracted from the medical charts of 118 patients with NIDDM in 6 rural and 4 urban family physicians' offices in Newfoundland. Seventy patients were from rural practices and 48 were from urban practices. Fifty-five patients were male, 63 were female and the mean age of the sample population was 64 years.

Main outcome measures: Family physician compliance with 9 procedures recommended by the CDA guidelines and glycosylated hemoglobin (HbA1C) levels.

Results: Compliance with CDA guidelines was in general somewhat low (mean 5.72 out of 9), compliance of rural physicians (mean = 5.36) was less than that of urban physicians (mean = 6.25). Patients of rural physicians appeared to have a similar degree of diabetes control when compared to patients of urban physicians (mean HbA1C: rural = 0.079, urban = 0.081), despite having fewer physician interventions, laboratory tests and referrals to dietitians. Fewer rural patients than urban patients used home monitors and fewer were taking insulin. Despite the poor compliance with guidelines, 87% of patients who had their HbA1C checked had levels in the optimal or acceptable range.

Conclusions: CDA compliance in a sample of 10 family physician practices was poor, with rural practices being less compliant than urban ones. Using HbA1C as a surrogate outcome measure of patient diabetes control, rural and urban physicians seemed to be doing equally well, despite fewer interventions by rural physicians. However, these results should be interpreted with caution, as this patient sample was small and HbA1C measurement was recorded in only about 50% of the patients. Further research into the possible differences in the care given to rural versus urban patients with NIDDM is suggested.

Résumé

Objectifs et méthode : Comparer dans quelle mesure les médecins de famille urbains et ruraux observent les lignes directrices de l'Association canadienne du diabète (ACD) au sujet du soin

des patients atteints de diabète sucré non-insulino-dépendant (DSNID). Comparer les taux de contrôle de la glycémie chez les patients atteints de DSNID traités par des médecins de famille ruraux ou urbains en utilisant les taux d'hémoglobine glycosylée (HbA1C) comme taux substitut pour mesurer le contrôle de la glycémie.

On a entrepris une vérification rétrospective des dossiers médicaux. Au moyen de formules normalisées fondées sur les lignes directrices de l'ACD, on a extrait, des dossiers médicaux de 118 patients atteints de DSNID dans les cabinets de six médecins de famille ruraux et de quatre médecins de famille urbains de Terre-Neuve, des renseignements sur le contrôle de la glycémie et de la lipidémie, la présence de complications diabétiques et les paramètres de traitement des médecins. Soixante-dix patients provenaient de pratiques rurales et 48, de pratiques urbaines. Il y avait 55 hommes et 63 femmes et la population témoin avait en moyenne 64 ans.

Principales mesures des résultats : Observation par les médecins de famille de neuf interventions recommandées dans les lignes directrices de l'ACD et taux d'hémoglobine glycosylée (HbA1C).

Résultats : L'observation des lignes directrices de l'ACD était en général faible (moyenne de 5,72 sur 9), et moins élevée chez les médecins ruraux (moyenne = 5,36) que chez les médecins urbains (moyenne = 6,25). Le diabète des patients des médecins ruraux a semblé contrôlé autant que celui des patients de médecins urbains (HbA1C moyenne : ruraux = 0,079; urbains = 0,081), malgré le nombre moins élevé d'interventions du médecin, des analyses de laboratoire et des présentations à des diététiciens. Moins de patients ruraux que de patients urbains utilisaient des moniteurs à domicile et prenaient de l'insuline. Même si les lignes directrices sont mal observées, 87 % des patients qui avaient fait vérifier leur HbA1C présentaient des taux qui se situaient dans la plage optimale ou acceptable.

Conclusions : Les lignes directrices de l'ACD étaient peu observées par un échantillon de 10 pratiques de médecine familiale, et les pratiques rurales les observaient moins que les pratiques urbaines. Si l'on utilise le taux de HbA1C comme moyen substitut de mesurer les résultats du contrôle du diabète chez les patients, les médecins ruraux semblent obtenir des résultats aussi bons que leurs collègues urbains même s'ils interviennent moins souvent. Il faut toutefois interpréter ces résultats avec prudence, car l'échantillon de patients était restreint et l'on a consigné le taux de HbA1C dans environ 50 % seulement des cas. On suggère de mener des recherches plus poussées sur les différences possibles au niveau des soins administrés aux patients ruraux atteints de DSNID par rapport à ceux que reçoivent les patients urbains.

Abbreviations: CDA (Canadian Diabetes Association), FBS (fasting blood sugar), RBS (random blood sugar), HDL (high-density lipoprotein), TG (triglycerides), HbA1C (hemoglobin A1C = glycosylated hemoglobin), NIDDM (non-insulin-dependent diabetes mellitus)

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Introduction

Is the medical care provided by family physicians to patients with diabetes who live in rural areas any different from the care that urban patients receive from their family physicians? The evidence is sparse and confusing. In Taiwan, people with diabetes who lived in 5 rural areas were found to have better blood glucose control, with a higher percentage under regular treatment, than people in 2 urban areas.1 Results from a mobile eye-screening clinic in England showed a greater prevalence of advanced diabetic retinopathy in patients living in rural areas and suggested regular screening of patients was less efficient there.2 A study in the United States (Alabama, Iowa and Maryland)3 found that diabetic patients covered by Medicare, who were receiving care from rural practitioners, were less likely to receive the recommended services. In Britain, however, urban and inner-city practices generally fell behind practices in rural and suburban areas in terms of services provided for people with diabetes.4

Family physicians generally play a large role in providing care to people with diabetes. The CDA's Clinical Practice Guidelines for Diabetes Mellitus5 provides the standard for the care of patients with diabetes by primary care physicians. Implicit in these guidelines is the conviction that patients with diabetes will receive benefit from tight control of blood sugar levels, as suggested by the results of the Diabetes Control and Complications Trial,6 although this trial was conducted exclusively on people with insulin-dependent diabetes. As such it is not yet certain that the results can be extrapolated to the large population of people with NIDDM who are cared for by family physicians.7

The present study involved Caucasians suffering from the most common type of diabetes -- NIDDM or Type II diabetes,8 who were receiving care from their family physician in Newfoundland, where the prevalence of diabetes is the same as in other parts of Canada.8,9

The primary objective of our study was to compare the level of compliance of rural and urban family physicians with the CDA guidelines for diabetes care in the community.5 The secondary objective was to compare blood sugar control levels in patients with NIDDM being cared for by rural or urban family physicians, who were using levels of glycosylated hemoglobin (HbA1C) as a surrogate measure of glycemic control.

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Methods

Ethical approval for this study was obtained from the Human Investigations Committee of the Faculty of Medicine, Memorial University of Newfoundland. The study was a retrospective chart review conducted in 10 family medicine clinics in Newfoundland; 6 clinics were rural and 4 were urban. The clinics were randomly selected from the Newfoundland Trials, Research and

Education Network for Family Physicians -- NEWTREND -- a group of 104 family physicians on the Avalon Peninsula of Newfoundland who have been willing to take part in research projects. Three medical student research assistants (A.P., J.K. and T.K.) were trained to extract data from family physician office charts. Approximately 2 weeks prior to the start of the study, each clinic received a form to record the chart numbers of the next 10 to 20 consecutive patients with a current diagnosis of NIDDM, present for at least 1 year, who visited the clinic. To be included in this study, patients had to identify the study clinic as their source of regular diabetes care. Using a standardized form based upon the CDA clinical practice guidelines, the following data were extracted from each patient's chart:

- Measures of physician management:
    a. Number of visits to family physician in the past year
    b. Number of diabetes-related laboratory blood tests performed in the past year, taken from the following list: HbA1C, FBS, RBS, cholesterol, HDL and TG
    c. Number of physical check-ups done in the past year
    d. Current medications for diabetes
    e. Referrals to dietitian, ophthalmologist, neurologist or nephrologist
- Blood sugar and lipid control measurements:
    1. The most recent HbA1C level
    2. Mean of fasting blood sugar determinations done in the past year
    3. Mean of random blood sugar determinations done in the past year
    4. Most recent total cholesterol level
    5. Most recent HDL level
    6. Most recent triglyceride level
- Presence of complications: was there a notation of
    1. Retinopathy: loss of vision?
    2. Nephropathy: microalbuminuria, albuminuria or renal failure?
    3. Neuropathy: any neurologic symptoms or signs?
    4. Other lower limb complications: foot sores or amputations?
- Patient ownership of reflectance glucometer

Some of the blood sugar and lipid control measurements were compared to the CDA's recommended optimal, acceptable and compromised levels. Some of the collected data were used to estimate physicians' compliance with CDA guidelines. We counted 9 parameters: blood pressure check, HbA1C measurement, FBS/RBS measurement, cholesterol level, weight check, urinalysis, foot examination and eye examination by the family physician within the past year (we were generous because the CDA guidelines suggest that most of these measurements be taken every 6 months) and whether there had ever been a referral to an ophthalmologist. A physician who was perfectly compliant with the guidelines would have done all 9 procedures, a less compliant physician would have done fewer procedures.

Descriptive statistics were used to characterize the patient population and to assess physicians'

adherence to the CDA guidelines. Chi2 tests were used to assess differences between proportions, and independent t-tests were used to test differences between means. An alpha level of 0.05 was designated as indicating statistical significance. Data were analysed using the Quattro Pro spreadsheet package,10 Epi Info11 and SPSS for Vax.12

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Results

In 6 rural and 4 urban clinics, the charts of 118 patients with NIDDM were reviewed. The charts of 70 patients (34 males, 36 females) were from the rural clinics and 48 (21 males, 27 females) were from the urban clinics. The mean age of rural patients was 64.6 years, with a mean duration of diabetes of 6.1 years; the mean age of urban patients was 63.1 years, with a mean duration of diabetes of 8.2 years. There were no significant differences between rural and urban patients for any of these demographic features (all $p > 0.05$).

Physician compliance with guidelines

Table 1 shows the percentage of rural and urban patients who had some or all of the 9 recommended CDA procedures done. Overall, the compliance rate with the 9 procedures was low; the overall mean rate was 5.72. There was a small but significant difference with respect to the mean number of procedures done by rural (5.36) and urban physicians (6.25) ($t_{116} = 3.02$, $p < 0.01$). All patients had had their blood pressure checked and had had either an FBS or an RBS measurement in the past year. Comparison of rural and urban patients with respect to the proportion who had the cholesterol level measured, weight checked, urinalysis, foot examination, eye examination and ophthalmologist referral indicated no statistical differences (all $p > 0.05$). However, significantly fewer rural patients (37.1%) had had an HbA1C test in the past year than the urban patients (77.1%) ($chi2 = 18.25$, $p < 0.001$). Fig. 1 shows rural and urban physician compliance with the guidelines.

Physician management parameters are shown in Table 2. There was no significant difference between the mean number of visits made by rural patients and the mean number made by urban patients ($t_{116} = 0.94$, $p > 0.05$). There was, however, a small but significant difference between rural and urban patients in the mean number of diabetes-related laboratory blood tests done in the previous year ($t_{116} = 2.60$, $p < 0.025$), with urban patients having more tests than rural patients.

A majority of patients were taking oral medication to control their diabetes. There were significantly fewer rural than urban patients taking insulin ($chi2 = 4.83$, $p < 0.05$), and therefore significantly more rural patients taking oral hypoglycemic medications ($chi2 = 4.36$, $p < 0.05$).

The most common referral for both rural and urban patients was to an ophthalmologist. There

were no significant differences in the referral rates of rural and urban patients to ophthalmologists, neurologists and nephrologists (all $p > 0.05$), but there was a significant difference in the dietitian referral rate, with the rate for rural patients being lower than for urban patients ($chi2 = 11.89$, $p < 0.001$).

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Measures of blood sugar and lipid control

Shown in Table 3 are the mean HbA1C, FBS, RBS and total cholesterol levels for rural and urban patients and, for comparison, the recommended standard levels from the CDA guidelines. No significant difference was found between the mean HbA1C levels ($t_{60} = 0.39$, $p > 0.05$) of rural and urban patients. Of the 53% of patients who had an HbA1C measurement, most had optimal or acceptable levels according to CDA standards. For rural patients 88% and for urban patients 87% of those tested had optimal or acceptable HbA1C levels, with no significant differences between proportions ($chi2 = 0.05$, $p > 0.05$). There were no significant differences in age or gender between patients who had HbA1C testing and those who did not, but there was a significant difference for the duration of diabetes ($t_{112} = 2.34$, $p < 0.025$) for these patients.

Although the percentage of rural patients (48.6%) who had an FBS test was significantly less than the percentage of urban patients (77.1%) ($chi2 = 9.66$, $p < 0.002$), there was no significant difference between the mean FBS levels of rural and urban patients ($t_{69} = 1.08$, $p > 0.05$). Approximately half of those who had an FBS test had optimal or acceptable levels; the proportion tested with optimal or acceptable levels was a little higher for rural patients (53%) but was not significantly different from that of urban patients (46%) ($chi2 = 0.35$, $p > 0.05$).

There was no significant difference in the proportion of rural (90.0%) and urban (91.7%) patients who had an RBS test ($chi2 = 0.09$, $p > 0.05$). No significant difference was found between the mean RBS levels of rural and urban patients ($t_{105} = 0.07$, $p > 0.05$). Of those who had an RBS test, the proportion of rural patients (67%) with optimal or acceptable RBS levels, according to CDA standards, was not significantly different from the proportion of urban patients (73%) ($chi2 = 0.45$, $p > 0.05$).

There was no significant difference in the mean cholesterol levels between rural and urban patients ($t_{72} = 0.19$, $p > 0.05$). For those who had their cholesterol checked, an optimal or acceptable cholesterol level was found in 55% of rural patients and 63% of urban patients; there was no significant difference between these proportions ($chi2 = 0.45$, $p > 0.05$).

Presence of complications and home glucometer ownership

A comparison of the rates of retinopathy, nephropathy (presence of albuminuria or renal failure),

neuropathy and lower limb disease between rural and urban patients is shown in Table 4. There were no significant differences between rural and urban population proportions with respect to any of these measures (all $p > 0.05$).

Over half of the patients had chart notations indicating they owned a home glucometer. Ownership of a monitor was significantly less common in the rural patients (44.3%) than in the urban patients (75.0%) ($chi2 = 10.95$, $p < 0.001$). The mean HbA1C of patients with monitors was 0.082, whereas the mean HbA1C of patients without monitors was 0.078.

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Discussion

Neither rural nor urban physicians showed a high level of compliance with the CDA clinical practice guidelines for the care of patients with diabetes. Of the 9 CDA-recommended procedures that we audited (and these were the bare minimum of the recommendations in the guidelines), urban physicians performed a mean of 6.25 procedures and rural physicians performed a mean of 5.36 procedures. Our results were similar to those found in a large US urban health maintenance organization,13 where physicians performed a mean of 4.9 of 8 recommended procedures.

Physicians were much more compliant with some procedures than others; all patients had their blood pressure checked, 83% had a weight check, 54% were referred to an ophthalmologist, 42% were seen by a dietitian and blood tests were commonly done. Other procedures were done much less often; only 31% had a foot check and 29% had an eye check recorded by their family physician. On average, both rural and urban physicians were visited by their diabetic patients approximately once a month; there was clearly ample opportunity for patients to raise concerns about their diabetes and for physicians to monitor the progress of the illness.

We found that although rural family physicians saw their patients as often as did urban physicians, they ordered fewer blood tests on their patients and referred them to dietitians less frequently. They tested HbA1C and FBS less frequently and far fewer of their patients used home glucose monitors. Despite this, the level of diabetes control of their patients, using HbA1C as a surrogate measure, was no worse than the level of control of the urban patients, who had received more interventions; nor were FBS and RBS levels different between urban and rural patients.

These results are perplexing. On the one hand, it is clear that both rural and urban family physicians were not overly compliant with the recommended management guidelines. Our results could be viewed as a "wake-up call" for physicians to improve their care of patients with NIDDM. On the other hand, 87% of tested patients had optimal or acceptable levels of HbA1C, and there was no difference in HbA1C levels between rural patients, who had fewer interventions, and urban patients.

Perhaps not all procedures suggested in the diabetes care guidelines will make a difference in changing patient outcomes, and family physicians are, knowingly or not, avoiding over-enthusiastic adherence to unproven measures of care; at present, evidence is lacking as to which care procedures are effective in improving patient outcomes in diabetes.14 Even if we did know which procedures are effective, the behaviour of family physicians would still have to be changed to improve compliance with guidelines; a recent British study of why physicians change their clinical practice showed that doctors are slow to change, continuing medical education -- the way most doctors learn about clinical guidelines -- has only a small part to play, and that other factors were more important to them.15

Some argue that the current target levels for metabolic control in people with NIDDM are too lax, and the American and Canadian diabetes associations are soon to bring out new guidelines. which will advocate more stringent glycemic control. If we had accepted only optimal as a level of good control, the proportions of tested patients with the required levels of HbA1C, FBS, RBS and serum cholesterol in our sample would have dropped from 87%, 49%, 69% and 58% to 57%, 14%, 43% and 30%, respectively. These levels are not something to be complacent about.

There is evidence that diabetes education can lower hospital rates for people with diabetes and that patient education is an important predictor of improved metabolic control.16 Diabetes education was not available to most of the patients in our survey, but -- in theory at least -- the advice of a dietitian was available. Even though we found that the referral rate of rural patients to a dietitian was significantly less than that of urban patients, rural patients' blood sugar and HbA1C control was no different from that of urban patients. This situation may seem counterintuitive, but there were obviously other factors which could have had an effect on the metabolic control of the patients in our study.

The present study has several limitations. It was retrospective; although the physicians were selected randomly, patients were a convenience sample, and we made the assumption that all information pertaining to this study was recorded in the patient's chart. The number of charts reviewed (118) was small, and the percentage of patients who had HbA1C testing (53%) was also small. These shortcomings reduce the generalizability of our findings. Further research will need to be done to replicate our findings and to explore the possible existence of other differences between the rural and urban management of diabetes.

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