

Improving diabetes management

Structured clinic program for Canadian primary care

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ABSTRACT

PROBLEM BEING ADDRESSED Adherence to diabetes treatment guidelines is often poor in primary care.

OBJECTIVE OF PROGRAM To introduce simple accessible interventions in our clinic to improve both physicians' adherence to diabetes treatment guidelines and patient outcomes.

PROGRAM DESCRIPTION A physician and a nurse practitioner used 3 interventions for diabetes care: 30-minute appointments, reminder telephone calls to patients, and standardized flow sheets. Evaluation of this structured program found that, after 3 years, these interventions had improved primary caregivers' adherence to diabetes care guidelines and several physiologic parameters in patients with diabetes (compared with outcomes of patients managed with the usual less structured approach).

CONCLUSION This program improved delivery of diabetes care in our clinic. We believe a similar approach could help other physicians and nurse practitioners in primary care practices increase their adherence to guidelines and improve the clinical outcomes of their patients.

RÉSUMÉ

PROBLÈME À L'ÉTUDE Les directives sur le traitement du diabète ne sont pas bien suivies au niveau des soins primaires.

OBJECTIF DU PROGRAMME Introduire dans notre clinique des interventions simples et accessibles, pour améliorer l'adhésion des médecins aux directives sur le traitement du diabète et ainsi améliorer les issues des patients.

DESCRIPTION DU PROGRAMME Un médecin et une infirmière praticienne ont ajouté 3 interventions au suivi des diabétiques: une rencontre de 30 minutes, des rappels téléphoniques aux patients et des notes évolutives standardisées. Après 3 ans de ce programme structuré, ces interventions avaient augmenté l'adhésion du personnel soignant aux directives sur le traitement du diabète et amélioré plusieurs paramètres physiologiques des diabétiques (par rapport aux patients traités par l'approche habituelle moins bien structurée).

CONCLUSION Ce programme a amélioré la prestation des soins aux diabétiques dans notre clinique. Nous croyons qu'une approche semblable pourrait aider d'autres médecins et infirmières praticiennes de soins primaires à mieux suivre les directives, améliorant ainsi les issues de leurs patients.

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Diabetes mellitus, a chronic disease that affects up to 1.4 million Canadians, causes substantial morbidity and mortality.¹ Effective management of patients with diabetes can reduce the complications associated with the disease.^{2,3} Current guidelines for optimal management of these patients require a multi-disciplinary approach in which family physicians are the main team members responsible for coordinating proper, timely care.^{2,3} In busy primary care practices, it is often difficult to adhere to these guidelines, but this might be because there is no organized approach to care.⁴⁻⁶ In Canada, primary care practitioners are the sole care providers for most patients with diabetes (77%), and these physicians have a low rate of adherence to clinical guidelines for treating diabetes.⁷

Many interventions have been used in efforts to enhance physicians' adherence to recommendations for diabetes care and, therefore, to improve patient outcomes. These interventions have included steering committees; dedicated diabetic clinics; education for care providers; patient education and self-management tactics; nutrition counseling; use of nurses following protocols; computerized monitoring and planning; redesigned office systems; cluster visits involving case managers, psychologists, nutritionists, pharmacists, and physician specialists; physician audits; performance incentives; and use of flow sheets.⁸⁻²³ Such interventions have sometimes improved the process of care, patient outcomes, or both.^{24,25}

A systematic review of 41 papers on quality of diabetic outpatient care found that multifaceted interventions targeted at physicians and organizational changes improved diabetic management, while patient-oriented interventions led to better patient outcomes.²⁴ Unfortunately, many of the interventions studied are not readily accessible to typical Canadian primary caregivers who manage patients with diabetes. For instance, several studies were conducted in health maintenance organizations that had access to independent performance incentives, case managers, steering committees, and on-site specialists.^{19,20,23}

The purpose of our program was to introduce simple, accessible interventions to improve adherence to clinical guidelines in a Canadian primary care setting with the ultimate goal of improving patient outcomes. Our clinic, a primary care centre staffed by 5 general practitioners and a nurse practitioner, services Wawa, Ont, a town of 3700 in northwestern Ontario with a catchment population of 6500. Wawa is 230 km away from the

nearest referral centre. Before we initiated this program, diabetic patients in our clinic were seen about every 3 months for 15-minute appointments and treated according to current diabetes guidelines.² There was no system in place to remind patients of their appointments. Blood tests were usually scheduled at 3-month intervals, but the results of tests were sometimes not available at the time of patients' next visits. Patients often attended their appointments without bringing their medications or their diabetic logbooks.

Program description

The program was implemented by a doctor and a nurse practitioner for their existing patients. The appointment load was divided evenly between these 2 primary caregivers. The program used 3 interventions previously described in the literature for improving quality of care. First, every 3 months, patients were given 30-minute appointments rather than the default 15-minute appointments normally given. Second, before each diabetes clinic day, a secretary telephoned each of the scheduled patients to remind them of their appointments, to remind them to bring all their medications and logbooks to the appointment, and to arrange for their routine blood work about 1 week before the appointment so that results would be available at the time of the visit. Third, a standardized diabetic flow sheet that followed the Canadian Diabetes Association's guidelines for care was used to record information on each patient.²⁶

A research associate used a historical cohort design to compare management of diabetic patients in the more structured program (intervention group) with patients treated in the usual fashion (reference group). Power analysis showed that a sample size of 27 patients per group was needed to detect a difference of 0.5% between the 2 groups in HbA_{1c} levels with 95% confidence and a standard deviation of 0.5% at a .05 level of significance. A total of 37 patients participated in the diabetes clinic program between July 18, 2001, and July 19, 2004. The reference group was of similar size and was randomly drawn from a computerized list of diabetes patients of doctors who did not use the more structured program. This process excluded patients who did not have family doctors. Patients in the reference group were treated according to current diabetes guidelines. The only difference between their management and that of the intervention group was that their management excluded the 3 program interventions. A chart review was conducted to compare the 2 groups of patients during this 3-year period by recording their demographic information, blood pressure, weight, blood biochemistry, prescribed medications, referrals, and immunizations. In both groups, patients who did not have at least 2 diabetic follow-up appointments during the study period were excluded from the analysis.

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We had sufficient data for analysis for 33 of the 37 patients in the intervention group and 35 of the 45 patients in the reference group. There was no significant difference between groups in demographic characteristics, follow-up time, baseline laboratory results, and medication use (Table 1).

Table 1. Baseline characteristics of intervention and reference groups: Characteristics were not significantly different between groups.

CHARACTERISTIC	INTERVENTION GROUP N = 33	REFERENCE GROUP N = 35	P VALUE
Mean age	62.7 y ± 15.1 SD	61.6 y ± 10.3 SD	.72
Proportion of women	61%	52%	.48
Mean follow-up time	19.7 mo ± 7.4 SD	19.1 mo ± 6.2 SD	.70

SD—standard deviation.

Improvements seen after implementation of the program

In the intervention group, HbA_{1c} and low-density lipoprotein levels and the ratio of total cholesterol to high-density lipoprotein decreased significantly, but did not do so in the reference group (Table 2). Weights and blood pressures did not change significantly in either group. None of the values shown in Table 2 differed significantly between groups at the start of the study or after the follow-up period.

Consistent with diabetes care guidelines, acetylsalicylic acid use increased significantly ($P < .01$) in patients older than 40 in the intervention group (Table 3). Referrals to ophthalmologists were significantly ($P < .01$) more frequent in the intervention group (Table 4). The number of pneumonia and influenza

vaccinations was not significantly different between groups (Table 4). Use of angiotensin-converting enzyme inhibitors and angiotensin receptor blockers by patients with microalbuminuria was not significantly more frequent in the intervention group.

Discussion

The purpose of our program was to improve caregivers' adherence to guidelines and diabetic patients' outcomes

Table 3. Acetylsalicylic acid use among patients in intervention and reference groups: Use increased significantly among those older than 40 only in the intervention group.

USE OF ACETYLSALICYLIC ACID	BEFORE	AFTER	P VALUE
Intervention group N = 30	30%	70%	<.001
Reference group N = 33	24%	45%	.10

Table 4. Vaccinations and ophthalmology referrals in intervention and reference groups: Vaccinations were not significantly more up-to-date among those in the intervention group, although a trend was seen with pneumonia vaccinations. Ophthalmology referrals were significantly more up-to-date only among patients in the intervention group.

VACCINATIONS AND REFERRALS	INTERVENTION GROUP (%) N = 33	REFERENCE GROUP (%) N = 35	P VALUE
Pneumonia vaccination	42	23	.08
Influenza vaccination	42	37	.66
Ophthalmology referral	91	63	<.01

Table 2. Laboratory markers of diabetic outcome: Markers improved significantly only in patients in the intervention group.

MARKER	INTERVENTION GROUP N = 33				REFERENCE GROUP N = 35			
	BEFORE	AFTER	95% CONFIDENCE INTERVAL	P VALUE	BEFORE	AFTER	95% CONFIDENCE INTERVAL	P VALUE
HbA _{1c}	7.8%	7.2%	-0.086 to -1.1	<.05	7.7%	7.4%	0.23 to -0.88	.24
Low-density lipoprotein	3.21 mmol/L	2.62 mmol/L	-0.20 to 0.97	<.01	3.14 mmol/L	2.98 mmol/L	0.29 to 0.63	.46
Total cholesterol to high-density lipoprotein ratio	4.76 mmol/L	4.21 mmol/L	-0.15 to 0.94	<.01	4.82 mmol/L	4.79 mmol/L	0.90 to -0.96	.95
Systolic blood pressure	141.8 mm Hg	137.1 mm Hg	2.7 to -12.0	.21	139.6 mm Hg	140.6 mm Hg	7.8 to -5.6	.74
Diastolic blood pressure	80.6 mm Hg	77.5 mm Hg	0.88 to -7.2	.12	81.7 mm Hg	79.6 mm Hg	1.9 to -6.0	.30
Weight	87.7 kg	89.0 kg	2.6 to -0.23	.10	91.8 kg	91.9 kg	1.6 to -1.4	.88

through 3 simple interventions: 30-minute appointments, reminder telephone calls, and use of flow sheets. We think our program improved on previous programs by using interventions that were simple to implement in our primary care setting and by avoiding interventions that required many resources or substantial organizational changes. Evaluation of our program using a historical cohort design found that the interventions resulted in improvement in caregivers' adherence to certain guidelines and in some physiologic parameters of diabetic patients. Patients treated according to the same guidelines without these simple interventions did not improve significantly during the study period.

A systematic review found that organizational and physician interventions could improve physicians' adherence to guidelines, while patient-oriented interventions could improve patient outcomes.²⁴ Our 3 interventions seem to have improved physicians' adherence and patients' outcomes. Longer counseling sessions might have provided enough time for physicians to encourage lifestyle changes effectively and to manage these complex chronic cases adequately. Telephone reminders might have improved the regularity of follow-up and laboratory tests. Flow sheets might have served as reminders and records specific to the complexities of diabetic treatment. Also, reserving an entire day for diabetes care might have increased caregiver efficiency and patient motivation by focusing attention on a particular area of patient health.

Despite statistically significant improvements, even in this small cohort, by the end of the follow-up period, the intervention group had not quite reached guideline target levels of $\leq 7\%$ for HbA_{1c}, ≤ 2.5 mmol/L for low-density lipoprotein, and ≤ 4.0 mmol/L for the ratio of total cholesterol to high-density lipoprotein or 100% physician adherence. Reasons for this could be insufficient length of follow-up time or a need for additional interventions in the program. Results of this study, however, were still encouraging. For instance, the $0.61\% \pm 0.15\%$ decrease in HbA_{1c} levels in the intervention group is similar to the decrease expected when one of several antihyperglycemic agents, such as acarbose, nateglinide, or orlistat, is added to patients' medication regimens.²

Results of our program evaluation were comparable to those of similar studies, although many of these studies were larger and more complex. An outpatient study of 144 patients by Benjamin et al,²⁷ using physician education combined with audit and feedback, showed that HbA_{1c} levels improved by $0.62\% \pm 0.3\%$ over 15 months to 8.68%, a significant difference, but also above target. These authors found that annual dilated retinal examinations increased from 32% to 63% of patients and annual influenza vaccinations increased from 30% to 73% of patients. Peters and Davidson²³ presented a health maintenance organization model, including educational materials, audit and feedback, organizational changes, and

follow-up arrangements. Their results showed a decrease in HbA_{1c} levels from 11.9% to 8.6%, a larger absolute improvement than in our program, but also above the guideline target. Overall cholesterol levels did not change between groups in that study. We are aware of only 2 programs beside ours that resulted in decreases in total cholesterol through improvement in quality of care.^{28,29} Neither of these programs led to improvement in total cholesterol to high-density lipoprotein ratios as ours did. Many studies found no improvement in weight or blood pressure,^{30,31} although some did.³²

Two primary caregivers participated in the diabetes clinic days, a physician and a nurse practitioner. Although most similar programs used nurses or nurse practitioners as assistants, the nurse practitioner at our clinic independently managed an equal share of the diabetes patients in our program and had the same role as the physician. We think the outcomes indicate that these results could be achieved equally well by either physicians or nurse practitioners working alone and do not suggest that both are needed to achieve the desired outcomes.

Limitations

Since the physician and nurse practitioner involved in the program enrolled only their existing patients at the time of program implementation, prospective randomization between intervention and reference groups did not occur. This created a selection bias, although the known characteristics of both groups were similar at baseline. Performance bias might have had a role, as the study was not blinded. A research associate, who was not involved in implementation of the program, conducted the evaluation independently to avoid detection bias during data collection.

Improvements to the program

To further improve our program, we plan to involve a diabetes educator during our structured diabetes clinic days. Patients will meet for group sessions with the educator either before or after their appointments. The session will allow patients to discuss common issues, such as diet and exercise, that might still need to be more completely addressed after clinic appointments. Holding these sessions on the same day as the diabetes clinic would improve access for our patients who will then not have to make a separate trip to attend the sessions.

Conclusion

Most diabetes care in Canada occurs at the primary care level where physicians' adherence to guidelines is often poor.⁷ Much evidence supports quality-improvement interventions for diabetes management to increase physicians' adherence to guidelines and to improve patient outcomes.²⁴ Our program used 3 interventions that could easily be used in most Canadian primary care practices: 30-minute appointments,

reminder telephone calls, and flow sheets. During a 3-year period, these interventions appeared to improve some of patients' physiologic parameters and primary caregivers' adherence to guidelines. A similar approach, using our interventions or other interventions cited in the literature, can be used by interested physicians or nurse practitioners to enhance the quality of their care of patients with diabetes. ❁

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EDITOR'S KEY POINTS

- Many interventions have been used in efforts to enhance physicians' adherence to recommendations for care of diabetic patients and to improve patient outcomes. Unfortunately, many of these interventions are not readily accessible to typical Canadian primary caregivers.
- This program introduced 3 simple, accessible interventions to improve adherence to clinical guidelines with the ultimate goal of improving patient outcomes. The interventions were 30-minute appointments, reminder telephone calls, and use of flow sheets.
- During a 3-year period, these interventions improved several physiologic parameters in patients as well as primary caregivers' adherence to guidelines. These improvements were in comparison with the outcomes of patients treated using the usual less structured approach.

POINTS DE REPÈRE DU RÉDACTEUR

- On a tenté plusieurs interventions pour inciter les médecins à suivre les directives sur le traitement des diabétiques et ainsi améliorer les issues des patients. Malheureusement, plusieurs de ces interventions ne sont pas facilement accessibles au intervenants de première ligne au Canada.
- Ce programme présente 3 interventions simples et accessibles susceptibles d'améliorer le suivi des directives cliniques, avec comme but ultime de meilleures issues pour les patients. Ces interventions consistent en rencontres de 30 minutes, rappels téléphoniques et utilisation de notes évolutives.
- Sur une période de 3 ans, ces interventions ont amélioré plusieurs des paramètres physiologiques des patients, mais aussi augmenté l'adhésion du personnel soignant aux directives. Les patients traités par l'approche usuelle moins bien structurée n'ont pas connu des issues aussi favorables.

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