Diabetes education through group classes leads to better care and outcomes than individual counselling in adults: A population-based cohort study

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ABSTRACT

OBJECTIVE: Self-management education, supported by multidisciplinary health care teams, is essential for optimal diabetes management. We sought to determine whether acute diabetes complications or quality of care differed for patients in routine clinical care when their self-management education was delivered through group diabetes education classes versus individual counselling.

METHODS: With the use of population-level administrative and primary data, all diabetic patients in Ontario who attended a self-management education program in 2006 were identified and grouped according to whether they attended group classes (n=12,234), individual counselling (n=55,761) or a mixture of both (n=9,829). Acute complications and quality of care in the following year were compared among groups.

RESULTS: Compared with those attending individual counselling, patients who attended group classes were less likely to have emergency department visits for hypo/hyperglycemia (odds ratio 0.54, 95% confidence interval [CI]: 0.42–0.68), hypo/hyperglycemia hospitalizations (OR 0.49, CI: 0.32–0.75) or foot ulcers/cellulitis (OR 0.64, CI: 0.50–0.81). They were more likely to have adequate HbA1c testing (OR 1.10, CI: 1.05–1.15) and lipid testing (OR 1.25, CI: 1.19–1.32), and were more likely to receive statins (OR 1.22, CI: 1.07–1.39).

CONCLUSION: Group self-management education was associated with fewer acute complications and some improvements in processes of care. Group sessions can offer care to more patients with reduced human resource requirements. With increased pressure to find efficiencies in health care delivery, group diabetes education may provide an opportunity to deliver less resource-intensive care that simultaneously improves patient care.

KEY WORDS: Diabetes mellitus; patient education; self care; health promotion; comparative effectiveness research

La traduction du résumé se trouve à la fin de l'article.

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Diabetes mellitus is a common chronic disease whose prevalence is growing.[1,2] It leads to numerous complications, which lower health-related quality of life and increase mortality.[3,4] The goal of diabetes management is to optimally control patients' blood glucose levels and other vascular risk factors, since intensive control lowers the risk of both diabetes complications and mortality.[5,6]

Much like for other chronic diseases, diabetes care is dependent on patients managing their own health. Patients are supported in this self-management by multidisciplinary health care teams, which give patients the skills and knowledge to care for their disease and its complications; to implement the self-monitoring, exercise and dietary behavioural changes needed to optimize their health; and to increase their confidence in their ability to achieve these desired outcomes.[7] Self-management education has been shown to improve diabetes knowledge, self-care behaviour, quality of life, glycemic control and weight.[8] However, there is some debate about how best to deliver this education. Individual counselling with the health care team may permit patients to more easily address their specific needs, circumstances and concerns. On the other hand, group-based education may be better connected to other community health care resources, and it may help create a peer-support network for patients with others affected by the same disease.[9] In addition, group education allows providers to see multiple patients simultaneously, thereby increasing the volume of patients who can be served.

Previously published trials have evaluated group- versus individual-based diabetes self-management education,[10-15] and although there have been conflicting results, they have generally shown better outcomes with group classes. As randomized trials, these studies could examine the *efficacy* of different formats of education delivery, but their external validity and generalizability are uncertain, because many were conducted in a single centre and because patients who agree to participate in trials of educational interventions are likely very different from the general population with diabetes. Hence, the *effectiveness* of group versus individual diabetes education formats in real-world clinical care is unknown. The objective of this study was to examine differences in acute diabetes complications and quality of care for unselected patients in routine clinical care who attended group diabetes self-management education classes versus individual counselling.

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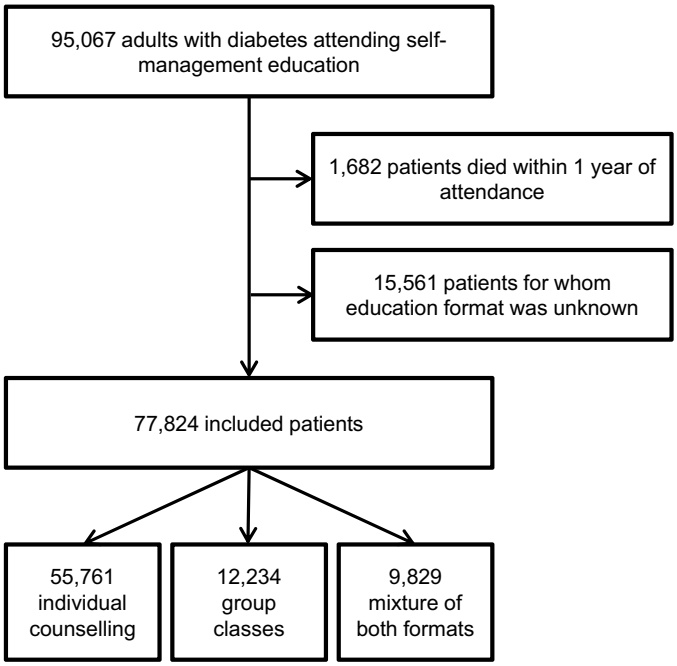

Figure 1. Patient flow

METHODS

Study design and data sources

This population-based cohort study used health care administrative databases that detail health care utilization by every resident of Ontario. These data sources included 1) the Registered Persons Database, a register of demographic information about all Ontario residents; 2) the physician service claims database, which records all fee-for-service billing claims from Ontario physicians and laboratories; 3) the discharge abstracts database, which records detailed information about each hospitalization to an Ontario hospital; 4) the Ontario Drug Benefits program claims database, which records information on all prescriptions filled under the provincial medication insurance program, for which all residents aged 65 years are eligible; and 5) the Ontario Diabetes Database, a validated registry of all people with a diagnosis of non-gestational diabetes in Ontario, which is derived from these administrative databases.[16] We also used a previously collected registry of all patient visits to all 331 diabetes self-management education programs in Ontario in the 2006 calendar year; the details of this registry have been described elsewhere.[17] The format of education (group class versus individual counselling) was collected for each patient visit. Individuals are linked between all of these databases and registries using their unique health card number, which is used by all Ontario residents to access health care services.

Population and exposure definition

All people with diagnosed diabetes who attended an ambulatory diabetes self-management education program in Ontario in 2006 were identified. Those who were <18 years on January 1, 2006, or who died before December 31, 2006, were excluded. Subjects were divided into those who attended group classes only, individual counselling sessions only, or a mixture of both. Patients for whom the education format was unknown were excluded. The date of the patient's first diabetes self-management education visit in 2006 was used as the index date.

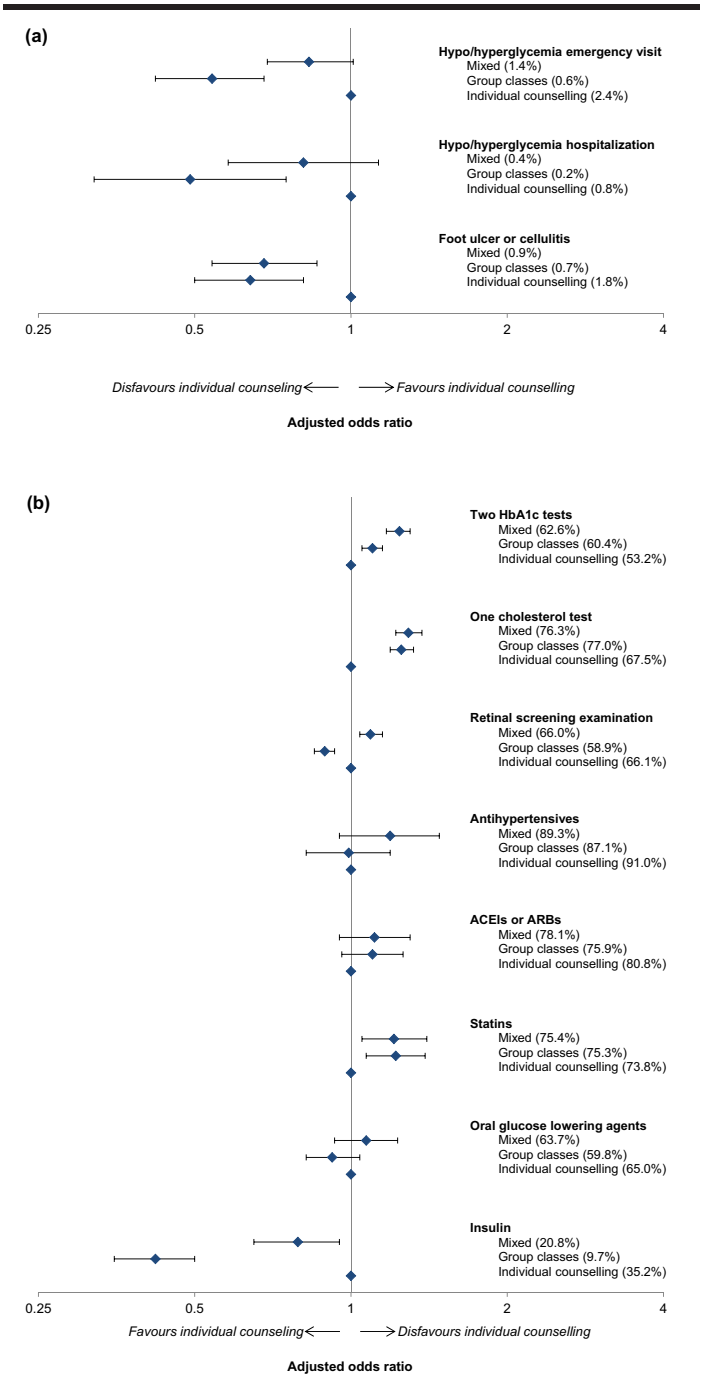

Figure 2. Adjusted odds ratios for each outcome, with individual counselling as the reference group. Percentages in parentheses represent the frequency of each outcome in each group. (a) Acute diabetes complications; (b) Quality of care measures.

Outcomes and covariates

Several outcome measures, calculated as dichotomous variables for one year from the index date, were determined for each patient. Acute complications of diabetes were emergency department visits for hypo/hyperglycemia; hospitalizations for hypo/hyperglycemia; and emergency department visits or hospitalizations for foot ulcers or cellulitis. Quality of care

Table 1. Baseline characteristics of diabetes patients attending self-management education in Ontario, 2006

	Individual counselling	Group classes	Mixed	*p*
n	55,761	12,234	9829	
Age in years, mean±SD	59.2±14.7	58.8±12.7	58.0±13.0	<0.001
Sex				<0.001
F	27,483 (49.29%)	6176 (50.48%)	5050 (51.38%)	
M	28,278 (50.71%)	6058 (49.52%)	4779 (48.62%)	
Duration of diabetes (years)				<0.001
0 to <1	11,083 (19.88%)	5467 (44.69%)	4129 (42.01%)	
1 to <5	13,058 (23.42%)	2995 (24.48%)	2071 (21.07%)	
5 to <10	12,046 (21.60%)	1881 (15.38%)	1592 (16.20%)	
10 or more	19,574 (35.10%)	1891 (15.46%)	2037 (20.72%)	
Socio-economic status quintile				<0.001
Lowest	12,037 (21.59%)	2456 (20.08%)	2171 (22.09%)	
2	11,849 (21.25%)	2603 (21.28%)	2111 (21.48%)	
3	11,200 (20.09%)	2438 (19.93%)	1917 (19.50%)	
4	10,949 (19.64%)	2378 (19.44%)	1974 (20.08%)	
Highest	9420 (16.89%)	2331 (19.05%)	1628 (16.56%)	
Missing	306 (0.55%)	28 (0.23%)	28 (0.28%)	
Rural residence	10,242 (18.37%)	834 (6.82%)	1345 (13.68%)	<0.001
General comorbidity				<0.001
Low	33,055 (59.28%)	7712 (63.04%)	6063 (61.68%)	
Medium	19,160 (34.36%)	4035 (32.98%)	3284 (33.41%)	
High	3546 (6.36%)	487 (3.98%)	482 (4.90%)	
Mental health disorder	14,342 (25.72%)	3302 (26.99%)	2510 (25.54%)	0.01
Primary care visits*				<0.001
0	2279 (4.09%)	212 (1.73%)	189 (1.92%)	
1 to 3	9757 (17.50%)	1619 (13.23%)	1507 (15.33%)	
4 to 6	14,973 (26.85%)	3499 (28.60%)	2758 (28.06%)	
7 to 12	18,715 (33.56%)	4743 (38.77%)	3508 (35.69%)	
13 or more	10,037 (18.00%)	2161 (17.66%)	1867 (18.99%)	
Number of education program visits, median (IQR)	2 (1–3)	2 (1–3)	4 (3–5)	<0.001
Hypo/hyperglycemia emergency department visits*	1780 (3.19%)	128 (1.05%)	158 (1.61%)	<0.001
Hypo/hyperglycemia hospitalization*	802 (1.44%)	52 (0.43%)	76 (0.77%)	<0.001
Foot ulcer or cellulitis*	1028 (1.84%)	95 (0.78%)	96 (0.98%)	<0.001
Two HbA1c tests*	32,920 (59.04%)	8643 (70.65%)	6604 (67.19%)	<0.001
One lipid test*	40,610 (72.83%)	10,328 (84.42%)	8040 (81.80%)	<0.001
Retinal screening examination*	33,200 (59.54%)	5834 (47.69%)	4915 (50.01%)	<0.001
Antihypertensives*†	17,229 (89.19%)	3080 (84.34%)	2408 (85.51%)	<0.001
ACEIs or ARBs*†	15,135 (78.35%)	2584 (70.76%)	2046 (72.66%)	<0.001
Statins*†	13,334 (69.03%)	2472 (67.69%)	1878 (66.69%)	0.02
Oral glucose-lowering agents*†	12,784 (66.18%)	2051 (56.16%)	1713 (60.83%)	<0.001
Insulin*†	5741 (29.72%)	281 (7.69%)	405 (14.38%)	<0.001

* Measured in the year prior to index date.
† Only among those patients aged ≥66 years at index date: n=19,317 for individual counselling, n=3652 for group classes and n=2816 for mixed.
IQR=interquartile range; HbA1c=glycated hemoglobin; ACEI=angiotensin-converting enzyme inhibitor; ARB=angiotensin receptor blocker.

measures were laboratory claims for at least two HbA1c (glycated hemoglobin) tests; a laboratory claim for at least one lipid test; and an optometry or ophthalmology claim for a retinal screening examination.

In addition, in the subset of patients over 66 years of age for whom baseline and follow-up medication prescription data were available, we also examined prescriptions for antihypertensives in general, angiotensin-converting enzyme inhibitors or angiotensin receptor blockers in particular, statins, oral glucose-lowering agents and insulin.

Baseline characteristics examined for each patient included age and sex; duration of diabetes; socio-economic status (based on quintiles of median household income assigned ecologically from the patient's home postal code); rural residence (based on the patient's home postal code); general co-morbidity (measured by calculating the number of Johns Hopkins Aggregated Diagnosis Groups applied to the patient, categorized as low=0 to 5, medium= 6 to 10 and high=11 or more);[18] previous mental health disorders (measured using a validated administrative data algorithm);[19] and frequency of primary care visits in the previous year. The number of self-management education program visits made by each patient was determined as a measure of intensity of utilization. The baseline frequencies of each of the three acute diabetes complications and eight quality-of-care outcome measures, as noted above, were also ascertained in the year before the index date.

Statistical analyses

Chi-squared and ANOVA (analysis of variance) tests were used to compare rates of the baseline characteristics among patient groups. Crude rates for each acute complication and quality of care measure were calculated. Logit-based generalized estimating equation (GEE) regression models were used to determine the independent effects of education format delivery, adjusting for all of the baseline characteristics, including the baseline rate of acute complications and baseline quality of care. The logit-based GEE methods are similar to logistic regression, but they account for the variance inflation due to clustering of individual patients within self-management education programs.[20] The analyses were performed using SAS version 9.3 (Cary, NC).

RESULTS

There were 95,067 adults with diabetes who attended a self-management education program in 2006 (Figure 1), of whom 1,682 were excluded because they died within one year. A further 15,561 patients were excluded because the format of their education was unknown; their baseline demographic and clinical characteristics were broadly similar to those included (Supplemental Table S1), apart from lower baseline rates of HbA1c and lipid testing, greater intensity of self-management education utilization and higher likelihood of residence in rural areas. The final cohort consisted of 77,824 patients, of whom

55,761 (71.7%) attended individual counselling, 12,234 (15.7%) attended group classes, and 9,829 (12.6%) attended a mixture of both education formats.

Table 1 shows the baseline characteristics of the patients. Patients living in rural areas were markedly less likely to use group classes. Those attending individual counselling were generally sicker patients with longer diabetes duration, greater pre-existing comorbidity, more acute complications of diabetes preceding their index visit and greater pre-existing use of medications. However, they were less likely to have previously received adequate laboratory testing compared with those attending group classes.

Figure 2 shows the frequency of each outcome in each group and the odds ratio (OR) for each outcome and group adjusted for the baseline demographic, clinical and quality-of-care differences among groups. For most outcomes, patients who attended individual counselling were at a disadvantage: compared with them, patients attending group classes were less likely to require an emergency department visit for hypo/hyperglycemia (adjusted OR 0.54, 95% confidence interval [CI]: 0.42–0.68), a hospitalization for hypo/hyperglycemia (OR 0.49, CI: 0.32–0.75) or an emergency department visit or hospitalization for foot ulcers or cellulitis (OR 0.64, CI: 0.50–0.81). Both patients attending group classes and those with mixed visit types were more likely than patients with individual visits to have adequate HbA1c testing and lipid testing, even after adjustment for baseline testing rates. Despite lower baseline utilization of statins, they were more likely to use statins during follow-up. However, patients attending group classes were less likely than those attending individual counselling to receive a retinal screening examination (OR 0.89, CI: 0.85–0.93) and were markedly less likely to receive insulin (OR 0.42, CI: 0.35–0.50).

DISCUSSION

The majority of people with diabetes attending self-management education programs received individual counselling rather than group classes. Utilization of individual counselling increased with increasing diabetes duration and was more common for patients living in rural communities, where assembling sufficient patients to run regular groups may have been difficult. However, patients attending group classes had fewer acute diabetes complications, and the quality of diabetes care in the year after their visit was better than for those attending individual sessions, even after adjustment for baseline differences in diabetes duration, co-morbidity, etc. Previous research has provided insight into why group classes may result in better care and outcomes than individual counselling: group classes tend to be longer in duration than individual visits, and the information received from group classes is rated as more "useful" by patients than that received at individual counselling; patients also value being able to share problems with similarly affected people.[12] Given that group classes are a more efficient use of self-management education resources (since providers can deliver care to multiple patients simultaneously), the finding that they also reduce acute complications and improve quality of care suggests that they should be the preferred method of delivering self-management education support where it is feasible to do so.

Patients with mixed visit types had quality of diabetes care generally similar to or better than those attending group classes, but had rates of hypo/hyperglycemia emergency department visits and hospitalizations similar to those attending individual counselling. It is unclear why, among those attending both types of self-management education visits, processes of care and foot ulcer outcomes appear to be influenced mainly by the group classes, whereas hypo/hyperglycemia outcomes are influenced mainly by the individual counselling. It is of note that patients attending individual counselling or with mixed visit types were markedly more likely to use insulin during follow-up (after adjustment for baseline insulin use), suggesting that these education formats were preferred for supporting and educating patients about insulin administration and dose adjustment.

Despite the heterogeneity in the delivery and curriculum of self-management education programs and in patient selection for these programs in our population-based study, group classes did demonstrate better quality of care than individual counselling. This result is consistent with several previously published efficacy studies comparing group classes versus individual counselling for diabetes self-management education. In the earliest trial, 170 patients with type 2 diabetes were quasi-randomly allocated to group or individual education.[10] After six months, patients assigned to group education had a 2.5%±1.8% reduction in HbA1c, whereas those in individual education had a 1.7%±1.9% reduction (p=0.05). A Cochrane review similarly showed better glycemic control following group classes than individual education.[11] In a pair of trials, investigators from Italy examined 62 patients with type 1 diabetes for three years and 112 with type 2 diabetes for five years after random assignment to regular group classes versus individual visits.[12,13] Those allocated to group classes demonstrated better diabetes knowledge and health behaviours, and had better quality of life. In the type 2 diabetes trial, they also had greater reductions in body weight and HbA1c. Meta-analysis confirmed that group classes improved glycemic control, diabetes knowledge, self-management skills and self-efficacy for patients with type 2 diabetes.[21] In contrast, a recently published trial comparing individual versus group education delivery for type 1 diabetes evaluated 437 patients who had completed the Dose Adjustment for Normal Eating education program at one of six centres in Ireland.[14] Follow-up visits were randomized to occur either as group classes or as individual visits, but after 18 months there was no difference in the HbA1c level, severe hypoglycemia or quality of life. Likewise, a German trial that followed patients up to 15 months found no difference in glycemic control, exercise, foot care or diabetes knowledge between group and individual education models.[15]

This study has several strengths compared with these previously published trials. First, it examined self-management education utilization in an entire population, not in a single centre, so the results are more generalizable. The use of population-level administrative data sources allowed for a comprehensive evaluation of patient outcomes with no loss to follow-up or missing data. To further improve generalizability, it examined utilization, care and outcomes of patients in real-world clinical care, not in a self-selected sample receiving idealized care through a randomized trial. Thus, this is the first study able to evaluate the effectiveness, not just efficacy, of group diabetes self-

management education in actual clinical practice. However, there are some important limitations of the study to highlight.

First, as an observational study, the reasons for selecting group or individual education sessions or a particular program were not known, and though we adjusted for many baseline demographic, clinical and quality-of-care factors, the possibility of unmeasured confounding factors remains. However, as this is an effectiveness study rather than an efficacy study, the absence of these data is less important. Second, using population-level health care data we were unable to distinguish type 1 from type 2 diabetes, so the analyses could not be stratified by diabetes type. However, the overwhelming majority of patients with diabetes in the population have type 2. Third, we had data available on self-management education program utilization only in the 2006 calendar year. Thus, any visits patients had in earlier or later years would have been missed, and thus their overall exposure to group classes and/or individual counselling may have been misclassified and their total intensity of diabetes self-management education underestimated. Fourth, many important measures needed to more comprehensively examine the quality and appropriateness of diabetes self-management education (such as self-care behaviours, HbA1c or other laboratory test results, or blood pressure levels) were not available. Additionally, we had comprehensive drug prescription information only on patients aged 65 or older; drug utilization-related measures could not be ascertained for younger patients. Fifth, the duration of individual counselling visits or group classes was not known, so a "dose response" could not be evaluated. Finally, the curricula of self-management education delivery at the programs included in this study were not standardized, so there was likely significant heterogeneity both between and within arms. However, these findings show the impact on quality of care in real-world delivery of diabetes clinical care in a population, where heterogeneity is expected, and they are concordant with the benefits of group classes over individual counselling seen in many randomized efficacy trials.

In conclusion, we found that adult patients with diabetes in Ontario who attended group classes had fewer emergency department visits or hospitalizations for acute diabetes complications, higher rates of adequate laboratory testing and greater use of statins than patients attending individual counselling. These benefits for group education in real-world heterogeneous clinical care mirror those of randomized efficacy trials. However, fewer than one in seven self-management education program attendees in Ontario attended group classes. In a time of increasing pressure to find efficiencies in health care delivery, shifting away from individual counselling towards group diabetes education, where feasible, may provide an opportunity to deliver less resource-intensive care that at the same time improves patient care.

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RÉSUMÉ

OBJECTIF : Une éducation à l'auto-prise en charge, appuyée par une équipe de soins de santé multidisciplinaire, est essentielle à une prise en charge optimale du diabète. Nous avons cherché à déterminer si les complications aiguës du diabète ou la qualité des soins diffèrent chez les patients recevant les soins cliniques habituels lorsque leur éducation à l'auto-prise en charge leur est offerte en groupe dans des classes d'éducation au diabète, plutôt que sous forme de counseling individuel.

MÉTHODE : À l'aide de données primaires et administratives populationnelles, nous avons identifié tous les patients diabétiques de l'Ontario ayant assisté à un programme d'éducation à l'auto-prise en charge en 2006 et nous les avons regroupés selon qu'ils ont assisté à des classes en groupe (n=12 234), reçu du counseling individuel (n=55 761) ou un mélange des deux (n=9 829). Nous avons comparé les complications aiguës et la qualité des soins au cours de l'année suivante dans ces trois groupes.

RÉSULTATS : Comparativement à ceux qui ont reçu du counseling individuel, les patients ayant assisté à des classes en groupe étaient moins susceptibles de s'être rendus à l'urgence pour cause d'hypo- ou d'hyperglycémie (rapport de cotes 0,54, intervalle de confiance de 95 % [IC] : 0,42–0,68), d'être hospitalisés pour hypo- ou hyperglycémie (RC 0,49, IC : 0,32–0,75) ou de souffrir de plaies du pied ou de cellulite (RC 0,64, IC : 0,50–0,81). Ils étaient aussi plus susceptibles d'avoir fait faire un test d'HbA1c (RC 1,10, IC : 1,05–1,15) et un bilan lipidique (RC 1,25, IC : 1,19–1,32), et plus susceptibles de recevoir des statines (RC 1,22, IC : 1,07–1,39).

CONCLUSION : L'éducation à l'auto-prise en charge reçue en groupe était associée à un moindre nombre de complications aiguës et à certaines améliorations du processus de soins. Les séances en groupe permettent de servir davantage de patients et exigent moins de ressources humaines. Étant donné les pressions accrues pour réaliser des économies dans la prestation des soins de santé, l'éducation au diabète en groupe peut être l'occasion d'offrir des services avec moins de ressources tout en améliorant les soins aux patients.

MOTS CLÉS : diabète sucré; éducation du patient; autosoins; promotion de la santé; recherche en efficacité comparative