Can J Diabetes 40 (2016) 120–125

Contents lists available at ScienceDirect

Canadian Journal of Diabetes

journal homepage: www.canadianjournalofdiabetes.com

Original Research

The Need Associated with Diabetes Primary Care and the Impact of Referral to a Specialist-Centered Multidisciplinary Diabetes Program (the NADIR Study)

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ARTICLE INFO

Article history:
Received 3 April 2015
Received in revised form
14 July 2015
Accepted 16 July 2015

Keywords:
diabetes management
cardiovascular risk factors management
goal achievement
primary care
specialist care

ABSTRACT

Objective: The impact of specialist care on glycemia and cardiovascular risk factors in patients with diabetes is uncertain. This observational cohort study investigated metabolic risk factors in patients referred to LMC Diabetes & Endocrinology for diabetes management.
Methods: The cohort included 306 consecutive patients with diabetes referred to LMC in Ontario between January and June 2010. Sources of prereferral data included consultation notes, records from primary care physicians and the Ontario Lab Information System. Postreferral data were obtained from LMC's patients' records.
Results: The mean duration of diabetes before referral was 11 years, and the mean baseline glycated hemoglobin (A1C) level was 8.8%. Among patients with uncontrolled A1C levels at baseline, 73% had had no A1C values ≤7% for up to 6 years before referral. Following referral, mean A1C levels decreased to 7.8% at 6 and 12 months (both $p<0.001$ vs. baseline). Attendance at diabetes education programs improved from 28% to 67% postreferral, and attendees achieved significantly greater A1C reductions than nonattendees (mean 1.1% vs. 0.7%, respectively).

Mean low-density lipoprotein levels declined from 2.3 mmol/L at referral to 1.8 mmol/L at 12 months ($p<0.05$). Mean blood pressure was similar, at 128/75 before and 129/75 mm Hg after referral; however, following referral, blood pressure improved from 143/89 to 134/80 ($p<0.001$) in patients with previously uncontrolled blood pressure. Use of guideline-recommended medications increased significantly following referral.
Conclusion: Referral to specialist care should be considered early in the course of diabetes in order to optimize management of glycemia and cardiovascular risk factors.

Mots clés :
la gestion du diabète
cardiovasculaires gestion des facteurs de risque
réalisation des objectifs
soins primaires
soins de spécialiste

RÉSUMÉ

Objectif : On ignore l'incidence des soins de spécialiste sur la glycémie et les facteurs de risque cardiovasculaire chez les patients souffrant de diabète. La présente étude de cohorte (observationnelle) examinait les facteurs de risque métabolique chez les patients orientés pour une prise en charge du diabète au LMC Diabète & Endocrinologie.
Méthodes : La cohorte comptait 306 patients consécutifs souffrant de diabète qui étaient orientés vers un centre LMC en Ontario entre janvier et juin 2010. Les sources de données pré-aiguillage étaient les suivantes: les notes de consultation, les dossiers provenant des médecins de soins primaires et le Système d'information de laboratoire de l'Ontario. Les données post-aiguillage étaient tirées des dossiers des patients des LMC.
Résultats : La durée moyenne du diabète avant l'aiguillage était de 11 ans, puis la concentration initiale moyenne de l'hémoglobine glyquée (A1c) était de 8.8%. Parmi les patients ayant des concentrations initiales d'A1c non maîtrisée, 73% n'avaient obtenu aucune valeur d'A1c ≤7% jusqu'à 6 ans avant l'aiguillage. Après

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1499-2671 © 2016 Published by Elsevier Inc. on behalf of Canadian Diabetes Association.
http://dx.doi.org/10.1016/j.jcjd.2015.07.004

l'aiguillage, les concentrations moyennes d'A1c diminuaient à 7.8% à 6 et à 12 mois (les deux p<0.001 *vs* au début). La participation aux programmes d'enseignement sur le diabète grimpait à 67% après l'aiguillage contre 28% avant l'aiguillage, et les participants obtenaient des réductions significativement plus grandes de l'A1c que les non-participants (moyenne de 1.1% *vs* 0.7%, respectivement). Les concentrations moyennes de lipoprotéines de basse densité baissaient de 2.3 mmol/l au moment de l'aiguillage à 1.8 mmol/l à 12 mois (p<0.05). La pression artérielle moyenne était similaire, soit 128/75 avant l'aiguillage et 129/75 mm Hg après l'aiguillage. Cependant, après l'aiguillage, la pression artérielle passait de 143/89 à 134/80 (p<0.001) chez les patients ayant une pression artérielle auparavant non maîtrisée. L'utilisation de médicaments recommandés par les lignes directrices augmentait significativement après l'aiguillage.
Conclusion: L'aiguillage vers les soins de spécialiste devrait être considéré dès le début du diabète afin d'optimiser la prise en charge de la glycémie et des facteurs de risque cardiovasculaire.

Introduction

Diabetes mellitus is a chronic metabolic condition that is attaining epidemic proportions in Canada and around the globe. Long-term uncontrolled hyperglycemia is associated with multiple microvascular and macrovascular complications, which are preventable with effective goal-based medical care (1–6).

In Canada, primary care physicians (PCPs) bear most of the responsibility for managing diabetes, particularly in patients with early type 2 diabetes. However, 3 separate Canadian data surveys published within the past 10 years (7–9) have shown that most patients managed in primary care do not achieve the glycemic control targets recommended by the Canadian Diabetes Association. Following the successful reduction in cardiovascular risk and mortality achieved by a multipronged specialist-led approach in the Steno-2 trial (10), which included control of glycemia, hypertension and dyslipidemia, smoking cessation and consideration of cardioprotective medications; such a multifactorial, comprehensive cardiovascular disease risk management intervention can be considered essential for patients with diabetes (11). However, effective reduction of these risk factors has not been achieved at the population level, neither in Canada (9) nor in the United States (12).

Information about referral patterns of patients with diabetes by PCPs, and the impact of integrated team-based, specialist-led care models in achieving better clinical outcomes, is scarce and equivocal (13–15). Hence, the Need Associated with Diabetes Primary Care and the Impact of Referral to a Specialist-Centered Multi-disciplinary Diabetes Program (NADIR) study was conducted to compare glycemia and cardiovascular risk factor management before and after PCP referral to LMC Diabetes & Endocrinology (LMC). This "real-life" observational cohort study also aimed to characterize the impact of improvements in diabetes education and pharmacotherapy changes on metabolic risk factor control following management by a specialist physician at LMC.

Methods

Clinic patients

LMC is a multisite, community-based, specialist-led, referral-based, multidisciplinary program that uses a single electronic medical record across its sites. For the purposes of this review, referrals to approximately 20 diabetes specialist physicians working at 7 Ontario-based LMC clinics within the Greater Toronto Area, which has a total population of 6.5 million, were eligible. Patients with type 1 or type 2 diabetes who were referred to LMC between January 2010 and June 2010 were eligible for inclusion in this observational cohort study. Exclusion criteria included: 1) referral by a doctor other than a PCP; 2) referral for a nondiabetes diagnosis; 3) past history of specialist physician treatment for diabetes at LMC or elsewhere; 4) newly diagnosed diabetes (<6 months duration); 5) a minimum of 2 prior visits with their PCPs, including A1C or lipids assessments, within 1 year before specialist referral, and at least 1 follow-up clinic visit with an LMC specialist physician ≥3 months after the initial consultation; 6) age younger than 18 years or older than 75 years; 7) severe renal insufficiency (estimated glomerular filtration rate <30 mL/min/1.73 m^2 at referral); 8) documented history of severe hypoglycemia or a documented less aggressive diabetes control goal; 9) enrolment in an LMC research protocol with an investigational therapy and 10) patient-signed consent form for inclusion in queries. An independent healthcare professional, who was blinded to the study hypothesis and design, examined all consecutive patient referrals between January and June 2010 and applied the above prespecified inclusion and exclusion criteria to determine eligibility.

Data collection and statistical analysis

Patient referrals were identified from the LMC referral database and anonymized such that subsequent identification was based solely on the patient's assigned number and initials. All patient confidentiality principles of Personal Health Information Protection Act were followed. Historical laboratory results for up to 10 years prior to the referral date were downloaded from the Ontario Lab Information System or retrieved from PCP records. The study was approved by the Research Ethics Review Board, IRB Services.

Study data are presented as means for continuous variables and as percentages for categorical variables. Comparisons between PCP care before referral and specialist care after referral were made using paired t tests or Wilcoxon rank sum tests for non-normally distributed data to find continuous variables. For categorical data, comparisons were made by using chi-square tests. Subgroup analyses of medication use within the cohort were performed using the McNemar test. All analyses were performed using SAS v. 9.2 software (SAS, Cary, North Carolina, United States), and p values <0.05 were considered statistically significant.

Results

A total of 2914 screened consecutive subjects met the broad inclusion criteria. The following reasons were given for exclusion of subjects by the blinded chart reviewer: 841 (32%) subjects were excluded because of incomplete data prior to referral or for referral by non-PCPs or for nondiabetes diagnoses; 708 (27%) subjects were excluded because of incomplete data postreferral or enrolment in another investigational therapy study; and 642 (24%) subjects were excluded because of historical consultation with a diabetes specialist physician prior to LMC referral or referral for newly diagnosed diabetes (≤6 months' duration). Other prespecified criteria accounted for the remaining 417 (16%) exclusions of subjects. Thus, the final NADIR cohort for analysis included 306 subjects (47% female, mean age 58 years). The mean duration of diabetes at the time of referral was 11 years, and only 28% of the cohort had received formal diabetes education prior to referral. Previous diabetes