# Nurse specialists co-managing diabetes within general practice

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## Introduction

Diabetes prevalence is rising, and in Australia affects an estimated 7.5% of those aged 25 years and over.[1,2] As in many developed countries there is an ageing population, and a shift in the focus of primary care towards management of chronic conditions.[3] Landmark studies, such as the UKPDS and DCCT, demonstrate the benefits of improving diabetes management and glycaemic control,[4,5] however 'non-specialist' services may lack the time and support structures to provide optimal care.[6]

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## Abstract

**Background:** Diabetes Co-management in General Practice (DCGP) is a regional project being implemented in general practices in areas of Melbourne.
**Aims:** To increase access to co-ordinated diabetes services and prevent avoidable diabetes-related hospital admissions through improved care, self-management, education and support.
**Methods:** Credentialed Diabetes Educators (RN-CDEs) co-manage diabetes care with the patient and general practitioner, using evidence based management, care plans and referrals. Contact can be at the clinic, home visits, or via 24 hour phone support. Involvement of the RN-CDE within the general practice includes checking databases, establishing recall systems, and practice nurse support.
**Results:** There is marked cultural diversity among patients (n=1571). The majority have non-English speaking backgrounds. Screening rates for $HbA_{1c}$ have improved (78.6% to 85.3%, $p<0.05$). Number of patients meeting $HbA_{1c}$ below 7% has increased (29,6% to 39.2%, $p<0.001$). There were significant reductions in diabetes related emergency department presentations at six month review (n=896, $p<0.001$), 12 month review (n=490, $p<0.001$) and 18 month review (n=215, $p=0.013$), and hospital admissions at six month review (n=896, $p<0.001$), 12 month review (n=490, $p<0.001$) and 18 month review (n=215, $p<0.01$). RN-CDEs have responded to 607 unscheduled contacts from patients and carers.
**Conclusion:** This article describes the experiences and outcomes of a general practice based project using diabetes specialist nurses. The project is successful in providing coordinated education and care, integrating the role of the RN-CDE into general practice clinics, and improving health outcomes for people with diabetes.
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## Key words

Diabetes education, general practice, hospital, nurse specialists, primary care

Type 2 diabetes is predominantly managed by general medical practitioners (GPs) with less than half of Australian general practices (40%) employing nurses to assist with healthcare delivery.[7] Diabetes education services can experience high demand however there is often a lack of knowledge among GPs regarding what is available.[8,9] Furthermore, barriers to care exist, especially among marginalised patients from culturally diverse,[10] low income,[11] and aged populations.[12] Against this background efforts are being made to move diabetes management towards more collaborative approaches,[13] particularly by using multi-faceted interventions to improve patient outcomes.[14]

The Diabetes Co-management in General Practice (DCGP) project operates in northern and western Melbourne, where communities experience many of the barriers to care identified above. There is an over representation of people with chronic conditions in the use of acute care services.[15,16] This article describes the experiences and outcomes of a Department of Health funded project, using diabetes specialist nurses to improve health outcomes for marginalised populations. Major project aims include increased access by the community to coordinated diabetes

services and support at general practice clinics, and reduced acute diabetes-related presentations to the public hospital system, by targeting interventions towards people with diabetes that are at high risk for complications and acute problems.

## Methods

### General Practices and RN-CDEs

Interested general practices are recruited through the locally based Divisions of General Practice, representing groups of GPs. The general practice is then linked with a RN-CDE who provides regular sessions at mutually agreed times. Eight RN-CDEs (5.4 full time equivalent) are currently working with 78 GPs across 20 general practices. RN-CDEs are specialist nurses who have completed post-graduate studies in diabetes and are credentialed through the Australian Diabetes Educators Association. In collaboration with GPs they provide ongoing clinical management, education, support and after-hours clinical advice to people with diabetes, together with diabetes expertise for the general practice.

RN-CDEs become part of the general practice team, with full access to patient records. The project model is individualised for each practice to accommodate business style, clinical systems, availability of resources, and number and complexity of patients with diabetes. The RN-CDE provides support for implementing and maintaining diabetes registers and recall systems, telephone support to patients, tailored diabetes self-management education, assessment according to best practice guidelines, care planning, and home or aged care facility visits.

### Patients

Patients enrolled into the DCGP project must be aged 18 years or over, diagnosed with diabetes, and a regular patient of the recruited practice. Verbal informed consent for participation is obtained at the initial assessment. Patients choosing not to participate continue with their usual medical care, with referral to other services as appropriate.

Prioritisation of enrolment for patients has been refined following examination of project data, and estimation of the relative risk factors for hospital presentation or admission among the project population. The RN-CDEs review all patient histories for one or more of the following criteria: $HbA_{1c} \geq 9\%$, a high risk foot, previous coronary heart disease event or treatment, microalbuminuria, diagnosis with diabetes for more than 15 years. Other factors affecting a person's health outcomes including health status, access to other resources, psychosocial issues, and self-management skills are also considered. Basic services and referral are offered to those newly diagnosed with diabetes and/or a having low risk when assessed using the identified relative risk criteria. Patients classified as having higher risk and medium-to-high intervention needs have a multidisciplinary plan of care developed and are followed up by the RN-CDE as clinically necessary, receiving a formal review at least six monthly. No change is made to GP access.

### Data collection

The RN-CDEs collect data for evaluation purposes at the initial assessment and every six months thereafter. Data collected includes clinical parameters, self-management behaviours, referrals and service provision, including unscheduled contacts between patients and RN-CDEs in response to problems with diabetes self-management. Data is collected on all hospital emergency presentations and admissions in the 2 years prior to baseline, and regularly post-baseline, to assess outcomes against the primary goals of the project. A diabetes-related presentation has one or more of the following attributes: directly related to diabetes such as hyperglycaemia, hypoglycaemia, diabetic ketoacidosis, hyper osmolar non-ketotic state; directly related to diabetes complications of retinopathy, nephropathy or diabetic neuropathy; any type of infection; investigations or management for cardiovascular disease condition or event; or foot ulcers or injuries.

From September 2002 to December 2004 full demographic and complication screening data was collected for the original data set (n=1279). From January 2005 the number of items in the dataset (baseline n=292) was reduced to simplify the data collection process and increase time available for service provision. Dataset items that were removed included some demographic data and some screening and management targets for diabetes complications.

### Exited patients

From the 1571 enrolled patients 208 have exited the project. Of the exited patients, 58.7% were assessed as having low intervention needs and returned to GP care with referral as required. Further reasons given for exiting included: failed to attend or refused to continue participating (14.4%), changed general practices (6.3%), moved to residential care (3.8%), deceased (1.9%), and other or not recorded (14.9%).

### Statistical analysis

Categorical data was analysed using chi square. Categorical data included the proportion of people meeting screening guidelines, and management targets for diabetes complications presenting to emergency department and admitted to hospital. Paired t-tests were used for

| Screening (frequency/target) | All baselines<br>Baseline %<br>(n=1571) | Baseline vs<br>6 mth review<br>Baseline % Review %<br>(n=897) | | Baseline vs<br>12 mth review<br>Baseline % Review %<br>(n=491) | | Baseline vs<br>18 mth review<br>Baseline % Review %<br>(n=216) | |
|---|---|---|---|---|---|---|---|
| **Data items - original and revised data set** | | | | | | | |
| HbA$_{1c}$* (6 mthly) | 74.8 | 78.6 | 85.3[a] | 80.2 | 85.3 | 81.0 | 87.5 |
| HbA$_{1c}$ target met* (≤7%) | 25.3 | 27.6 | 39.2[c] | 28.8 | 36.3 | 30.1 | 38.9 |
| Lipids* (12 mthly) | 86.2 | 87.7 | 90.4 | 89.8 | 91.6 | 92.1 | 96.3 |
| **Data items - original data set only** | **(n=1279)** | **(n=667)** | | **(n=335)** | | **(n=108)** | |
| Feet (12 mthly/ 6 mthly if high risk) | 34.6 | 39.6 | 86.1[c] | 41.2 | 89.9[c] | 50.0 | 92.6[c] |
| Body Mass Index (6 mthly) | 31.1 | 39.4 | 73.3[c] | 39.4 | 77.0[c] | 37.0 | 78.7[c] |
| Blood pressure (6 mthly) | 83.5 | 82.5 | 90.4[c] | 82.7 | 89.6 | 85.2 | 95.4 |
| Retinopathy (1–2 yearly) | 65.1 | 71.4 | 80.5[b] | 71.6 | 83.3[b] | 74.1 | 90.7[a] |
| Renal function (12 mthly) | 61.1 | 64.2 | 77.7[c] | 69.0 | 84.2[c] | 72.2 | 89.8[a] |
| All above tests completed | 9.0 | 16.3 | 47.4[c] | 16.4 | 53.7[c] | 16.7 | 63.9[c] |

*Totals for these areas (HbA$_{1c}$ and lipids) differ due to a change in data collection processes
[a] Statistically significant difference between review and baseline data $p<0.05$, Chi Square
[b] Statistically significant difference between review and baseline data $p<0.01$, Chi Square
[c] Statistically significant difference between review and baseline data $p<0.001$, Chi Square

**Table 1.** Proportion of patients being screened for diabetes complications and reaching target HbA$_{1c}$ at baseline and subsequent reviews

the continuous variable of HbA$_{1c}$ results when subjects were matched with their own baseline. Results are reported as statistically significant if the p value is ≤0.05 or the actual level of statistical significance is reported. Statistical analysis is reported on all patients that have had a baseline assessment, and each subsequent review matched to their own baseline. Subsequent reviews have been matched to baselines results to account for differences in patients that have had a review versus patients that have not had a review assessment.

## Results
### Characteristics of enrolled patients
At time of data analysis 1571 patients in total had undergone a baseline assessment, and 897 of baseline patients had a six month review. Of the 897 patients who have had a 6-month review, 491 have also had a 12-month review, and of these, 216 have also had an 18-month review. The project is continuing and new patients are still being recruited. Some patients have not been in the project long enough to have a review assessment or have had fewer review assessments than patients that were recruited over 18 months ago.

As the original data set was reduced and therefore data on all variables is only available for patients who received a review based on the original data set: 667 patients at 6-month review, 335 at 12-month review, and 108 at 18 month review.

Type 2 diabetes represented 95.1% of the baseline patients (n=1571). Type 1 diabetes comprised 4.4% of patients and 0.5% were not defined or other type. Analysis of patients by age group (n=1569, 2 missing data) shows that the majority are aged 50–79 years (79.8%). The average age for female patients is 63.4 years (range 20–89, SD±12.8) and for males 63.4 years (range 19–92, SD±12.4). Male patients outnumber females participating in the project (52.0% versus 48.0%).

Patients (n=1279) originated from 57 countries, the majority (62.7%) spoke a primary language other than English. Clinics attracted higher numbers from ethno-specific groups where a GP

shared the primary language. Self-reported data was collected for education level and socio-economic status (n=1279). The education level reported by patients was primary school only (50.8%), secondary school (38.5%), tertiary (7.5%) and pre-primary or no formal education (2.8%). Receipt of government income support payments (aged or veterans pension, unemployment benefit, health care card) were the indicators used for lower socio-economic status in the original data set. The majority of patients (75.8%) received these payments.

### Increasing access to diabetes education and support

Only 5.2% (67/1279) of patients had consulted a diabetes educator in the 12 months prior to project entry compared to 100% once enrolled. Frequency of clinical contacts with RN-CDE was recorded for reviewed patients (n=852). The mean number of contacts per annum (adjusted for project entry date) was 5.0 at the general practice, 1.6 by phone, and 0.7 home or residential care visits. RN-CDEs identified that an interpreter was needed for 15.0% of people (236/1571). Formal interpreting support was received by 19.5% (46/236) and a further 53.4% (126/236) utilised a bilingual RN-CDE.

To date 15.4% (242/1571) of patients have had 607 unscheduled contacts with the RN-CDE, most occurring via phone (66.9%). When questioned about what they would have done if RN-CDE support was unavailable the responses were: in 8.6% (52/607) of contacts they would have attended a hospital emergency department and in 1.4% (7/607) called an ambulance. Acute care referral was required by 1.6% (10/607). Patients who accessed the unscheduled contacts

| | Baseline - Mean (SD)% | Review - Mean (SD)% | $p^a$ |
|---|---|---|---|
| Baseline patients (n=1165) | 7.90 (1.66) | - | - |
| 6-mth review patients (n=794) | 7.83 (1.67) | 7.55 (1.48) | 0.000 |
| 12-mth review patients (n=433) | 7.76 (1.61) | 7.50 (1.38) | 0.000 |
| 18-mth review patients (n=192) | 7.80 (1.59) | 7.51 (1.34) | 0.065 |
| [a] Paired t-tests, 2 tailed | | | |

**Table 2.** Mean available $HbA_{1c}$ percentage results at baseline, and at each subsequent review matched to baseline results



[a] Statistical significance of difference between review compared to baseline calculated using chi square on raw data
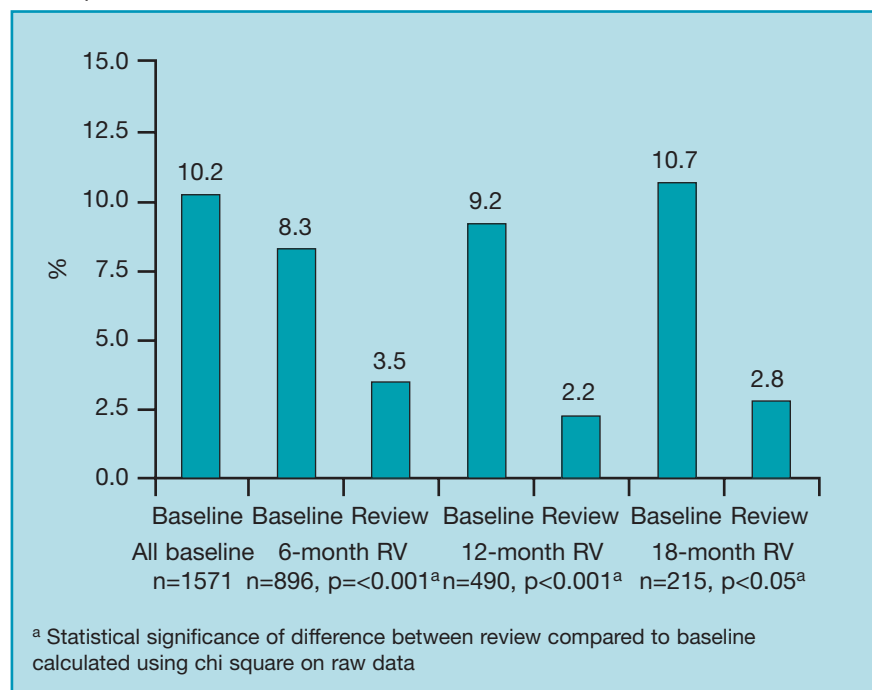
**Figure 1.** Proportion of patients presenting to emergency department for diabetes related events at baseline and compared to reviews

service (n=242) had an average of 2.5 (range 1–29, median 4) contacts in total, and 1.3 (range 0.3–10.2, median 0.9) contacts per annum. The distribution for number of contacts was skewed, the majority of patients (53.7%) had one contact and 9.1% of patients accessed 36.6% of contacts (range 6–29). The reason for unscheduled contacts was related to insulin stabilisation for 55 patients, and accounted for 21.9% (133/607) of total contacts.

### Insulin use
Medication type was recorded for 648 patients with type 2 diabetes who had received one or more reviews. At baseline 13% (84/648) were on insulin and 6.5% (42/648) have been commenced on insulin while involved in the project.

### Increased rates of assessment, complication screening, and meeting $HbA_{1c}$ targets
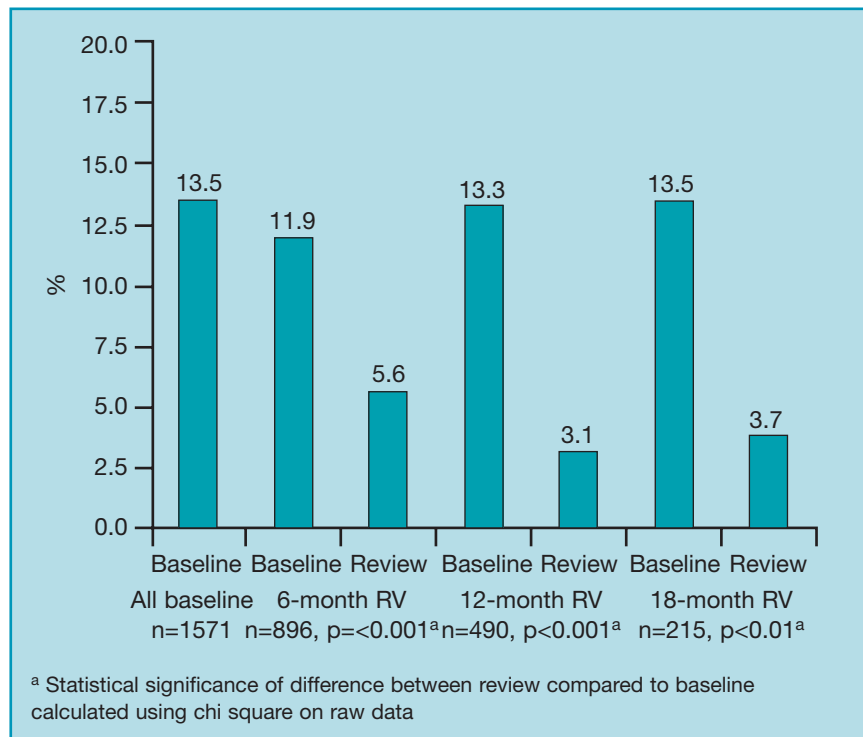Data on the proportion of patients meeting recommended

**Figure 2.** Proportion of patients presenting to emergency or admitted to hospital for diabetes related events at baseline and compared to reviews

best practice screening frequencies for diabetes complications and management target for $HbA_{1c}$ is shown in Table 1. Data is provided at baseline, and at reviews compared to the associated baselines. Lipids and $HbA_{1c}$ results have been retained in the new dataset and therefore higher numbers of results for these tests are reported. In Table 2 the mean $HbA_{1c}$ results at review are compared to associated baselines. $HbA_{1c}$ results were not available for some patients at baseline and review assessments due to circumstances including new diagnoses or missed appointments.

*Diabetes-related hospital presentations*
The proportion of patients presenting to emergency department for diabetes related events prior to baseline and for each review period compared to associated baseline is shown in Figure 1. The proportion of patients admitted to hospital for

diabetes related events prior to baseline and for each review period compared to associated baseline is shown in Figure 2.

## Discussion
The DCGP project focuses on clinical service delivery and quality improvement in diabetes care. However the decision to collect extensive data at project commencement has provided the opportunity for detailed analysis of the outcomes to date. There are limitations to the interpretation of the data due to nature of the project, and the lack of experimental design or controls. Nevertheless, some useful insights emerge for those working to improve diabetes management within the general practice setting. Higher numbers of patients were enrolled from marginalised groups which are known to experience barriers to care. The patient contact data indicates greater access to diabetes

education compared to the twelve months pre-entry. Slightly more men than women participated, suggesting no major gender differences in acceptance of this model as a means of approaching diabetes care. Other influences on acceptance might include patients feeling more comfortable using a service located in familiar surroundings, where there are strong links to their own GP and the absence of a consultation fee, since many participants had low income levels.

One issue reported by RN-CDEs working with less fluent or non-English speaking patients was the constraints on interpreter use. Limiting factors included interpreter availability at the time required, government funding limits, and patient preference for using a relative or friend to facilitate communication. Cultural sensitivity and appropriateness of care are important influences on health outcomes for people with diabetes.[17] While there was a marked increase in access to diabetes educators, a lack of diabetes information exists in several community languages, and available materials often required higher literacy levels than many enrolled patients had achieved in their primary language, creating difficulties for these patients.

Starting patients on insulin has been viewed as time-consuming and complicated by GPs, especially for patients with complex health needs, or other barriers such as literacy, limited English language skills or treatment resistance.[18,19,20] There has been a substantial rise in insulin use among the patient group compared to baseline and this reflects increased efforts to improve glycaemic control. GPs have found the RN-CDE support for commencing insulin therapy valuable. Referral to services such as district nursing is made for

those patients requiring ongoing assistance with self-care.

One of the major strengths of DCGP has been the approach of integrating the RN-CDE into the general practice team, rather than positioning them as external 'specialists' with a short-term, project based focus. Previous studies have shown that process changes alone may not be accompanied by improvements in patient outcomes.[21] RN-CDEs used a multifaceted approach of improving clinical and self-management skills with other diabetes services and access to after hours support and advice, combined with process changes (through supporting systems including disease registers and recall). Decreasing HbA$_{1c}$ results and reducing the proportion of patients with diabetes-related emergency department presentations and hospital admissions are examples of the outcomes achieved through this approach. The project has also demonstrated substantial and significant increases in neglected areas of screening for diabetes complications.

DCGP project data affirms the value of the RN-CDE role in primary care to assist GPs in best practice management of diabetes, and to achieve better outcomes for people with this condition. This has resulted in demonstrable benefits for the health care team as a whole, and to its most important member, the patient.

### Conflict of interest:
None

### References

1. Zimmet P. The burden of type 2 diabetes: are we doing enough? *Diabetes Metabol* 2003; **29**(4 Pt 2):6S9–18.
2. Dunstan D, Zimmet P, Welborn T, *et al*. *Diabesity & Associated Disorders in Australia 2000: The Accelerating Epidemic*. Melbourne: International Diabetes Institute, 2001; 7–11.
3. Weller D, Dunbar J. *General Practice in Australia: 2004*. Canberra: Commonwealth Government Publishing Service, 2005.
4. The DCCT Research Group. The effect of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus. *N Engl J Med* 1993; **329**(14): 977–986.
5. UKPDS Study Group. Intensive blood glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes (UKPDS 33). *Lancet* 1998; **352:** 837–853.
6. Bonney A for National Divisions Diabetes Program. *Diabetes care in general practice: Developments in Australia and perspectives from the literature*. Centre for GP Integration Studies, School of Community Medicine, UNSW, 2000.
7. Australian Divisions of General Practice. *Practice Nurse Workforce Survey 2003*. Canberra: Author, 2003.
8. Colagiuri R, Goodall S. *Information and education for people with diabetes: A best practice strategy*. Canberra: Diabetes Australia, 2004; 29-39.
9. Chittleborough C, Cheek J, Grant J, *et al*. *Education and information issues among people with diabetes*. Centre for Population Studies in Epidemiology, Adelaide: South Australian Department of Human Services, 2002.
10. Von Hofe B, Thomas M, Colagiuri R. *A Systematic Review of Issues Impacting on Health Care for Culturally Diverse Groups Using Diabetes as a Model*. Sydney: Australian Centre for Diabetes Strategies & Multicultural Health, 2002; 5–9.
11. Mathers C, Vos T, Stevenson C. *The burden of disease and injury in Australia (AIHW cat. no. PHE 17)*. Canberra: Australian Institute of Health and Welfare; 1999.
12. Eakin EG, Bull SS, Glasgow RE, *et al*. Reaching those most in need: A review of diabetes self-management interventions in disadvantaged populations. *Diabetes Metab Res Rev* 2002; **18**(1): 26–35.
13. Royal Australian College of General Practice & Royal College of Nursing Australia. *General Practice Nursing in Australia*. Canberra: Author, 2004.
14. Renders CM, Valk GD, Griffin SJ, *et al*. Interventions to improve the management of diabetes in primary care, outpatient, and community settings: A systematic review. *Diabetes Care* 2001; **24:** 1821–1833.
15. Department of Human Services, Victoria. *Hospital admission risk program (HARP): Background paper*. Melbourne: Author, 2002.
16. Department of Human Services, Victoria. *Hospital admission risk program (HARP): Establishing the base for preventative services*. Melbourne: Author, 2004.
17. Philis-Tsimikas A, Walker C. Improved care for diabetes in underserved populations. *J Ambul Care Manage* 2001; **24**(1): 39–43.
18. Skinner TC. Psychological barriers. *Eur J Endocrinol* 2004; **151:** T13–T17. http://www.eje.org [Accessed on 14 January 2006]
19. Hirsch IB, Bergenstal RM, Parkin CG, *et al*. A real-world approach to insulin therapy in primary care practice. *Clin Diabetes* 2005; **23:** 78–86.
20. Boyages S. When and how to start insulin therapy in type 2 diabetes. *Medicine Today* 2005; Supplement (Update on Diabetes): 10–16.
21. Renders CM, Valk GD, Franse LV, *et al*. Long-Term Effectiveness of a Quality Improvement Program for Patients With Type 2 Diabetes in General Practice. *Diabetes Care* 2001; **24:** 1365–1370.