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ORIGINAL ARTICLE

Management of diabetes in primary care: A structured-care approach

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Abstract

Background: In the Irish Midland Health Service Executive (HSE) Diabetes Structured Care Project, additional resources were targeted at general practice in the absence of a local hospital-based specialized diabetes unit. *Objective:* We assessed the performance of the Midland HSE Diabetes Structured Care programme in 2003, bench-marked against Primary Care Trust (PCT) data from the 2003/2004 National Diabetes Audit for England. *Methods:* Data on 947 patients (72% of eligible patients) from all 20 general practices participating in the structured-care programme were collected retrospectively over a 12-month period. The data included demographic and clinical variables as well as key process-of-care and intermediate outcome indicators used in the National Diabetes Audit for England. *Results:* The level of recording of process-of-care measures was near or above the upper quartile for PCTs in England. The proportion of patients with HbA_{1c} concentrations at target levels ($<6.5\%$) in the Midlands HSE project (26.8%) was virtually identical to the upper quartile level for PCTs in England (27.4%). The proportion of patients reaching target total cholesterol levels (<5.0 mmol/l) (54.6%) was close to the mean for PCTs in England (56.6%), and performance with regard to target blood pressure levels was equally poor in both the Midlands HSE (18.0%) and in PCTs in England (20.8%).

Conclusion: Primary-care-led structured care, with relatively limited but well-focused investment, can achieve quality of care for patients with diabetes, comparable to international best practice.

Key words: *Diabetes management, primary care, structured care*

Introduction

The prevention, diagnosis, and management of diabetes pose a substantial and increasing challenge for health systems worldwide. Unfortunately, the quality of care provided to the majority of patients with diabetes worldwide is poor, reflecting the dominance of hospital-led, acute illness models of care and limited investment in systems to manage chronic conditions in the community (1–4). However, in recent decades, there has been a shift from secondary to primary care in the provision of services for people with chronic disease, including diabetes, in many developed countries (3–5). The development of diabetes shared-care programmes is a manifestation of this phenomenon (6,7). The essence of shared care is agreement across the primary–secondary care interface on core structures and processes of care, including clinical practice guidelines, clinical pathways, and the development of responsive and accessible patient information systems. In recent years, the concept of shared care has evolved towards primary-care-led structured diabetes care models (8,9) and chronic disease management models for diabetes involving primary and secondary care providers working with the patient and the wider community. The term structured care reflects the anchoring of diabetes care in primary care and the structured support provided to participating general practitioners, including clinical, administrative, educational, and audit/research support (8). There is emerging evidence that implementation of primary-care-led structured diabetes care is associated with improved outcomes for patients (9,10). There is, however, a dearth of published data on the performance of diabetes

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structured-care programmes to support national and international benchmarking.

The Midland Health Service Executive (HSE) Diabetes Structured Care Programme, in the Laois/Offaly and Longford/Westmeath Local Health Areas, is one of the longest-established primary-care-based diabetes care programmes in Ireland (11). It was established in 1997/1998 through a partnership between a number of general practitioners (GPs) with an interest in diabetes and the Midland Health Board Department of Public Health and Planning. The Midland HSE area did not have a local specialist diabetes unit in 2003. Patients with diabetes are managed in primary care with structured specialist support provided to participating practices, including nurse specialists, enhanced access to dietetic, ophthalmology, and chiropody services, and "fast track" referral to the vascular services at Midland Regional Hospital Tullamore. Participating practices also receive education inputs for GPs and practice nurses and project management support for the development of local clinical guidelines, protocols, and quality-assurance systems. The Diabetes Structured Care Programme has not as yet been funded at the level required to develop a diabetes register or operate information technology (IT)-based patient recall and clinician reminder systems. Structured care for patients with diabetes is now provided in 30 general practices across the Midland HSE region. Over 3000 patients with diabetes are currently registered with participating practices.

The objective of this study was to assess the performance of the Midland HSE Diabetes Structured Care programme in 2003, using key process and outcome indicators. The findings were benchmarked against the data from the 2003/2004 National Diabetes Audit for England, to place the performance of the Midland HSE Diabetes Structured Care programme in context with regard to the international evidence base on the management of diabetes in primary care.

Patients and methods

Data from all 20 practices participating in the Midland HSE Diabetes Structured Care Project were collected in 2003 by a diabetes nurse specialist working with the Structured Care project manager and a research assistant. The data were abstracted from the patients' clinical notes (paper based and electronic) and the Diabetes Structured Care Book of all patients with known diabetes in the participating practices (a total of 1324 patients), and recorded onto a paper-based audit form provided by the St. Vincent Declaration Primary Care Diabetes Group. Data were gathered retrospectively over a 12-month period to the date that the research team attended each practice. All patients were asked to return a signed consent form confirming their agreement to the inclusion of their health data in the audit. Data for analysis are available from 947 patients who returned the consent form, 72% of the total. Data were collected on demographic, clinical, and lifestyle variables including age, gender, type of diabetes, smoking status, alcohol consumption, height, and weight. Type 1, type 2, and gestational diabetes were defined on the basis of standard clinical and blood glucose criteria (12) including the presence or absence of insulin dependency at diagnosis. Additional diagnostic data on diabetes subtypes were not available. Smoking was recorded as current smoking status, while alcohol consumption was based on weekly units of alcohol consumed. Body-mass index (BMI) was calculated as a function of weight (kg) divided by height (m^2). Additional data were also gathered on key process-of-care measures and intermediate outcome measures, including glycosylated haemoglobin (HbA_{1c}), serum cholesterol, and blood pressure (BP). All biochemical outcome measures were collected using the most recent value recorded. HbA_{1c} was assayed in the Mullingar and Tullamore District Hospitals using a DCCT-aligned method. Blood lipids were measured in the Mullingar and Tullamore Hospitals using standard automated analysers. In this report, we use the outcome indicators (treatment targets for HbA_{1c}, serum cholesterol, and BP) adopted for the National Diabetes Audit for England.

Inclusion criteria

All patients over 18 years of age, with type 1 or type 2 diabetes, who were registered with one of the 20 participating practices and who provided a signed consent form were eligible for inclusion in the study.

Data analysis and presentation of findings

The data were analysed using SPSS for Windows (version 12). Standard descriptive statistics are used throughout the report. Categorical data are presented as number, percent, and 95% confidence intervals, as appropriate. The 95% confidence intervals on proportions were estimated using the exact Clopper-Pearson method (StatsDirect Statistical software, version 4). Benchmarking data on recording of process-of-care measures and achievement of core treatment targets were obtained from the National Diabetes Audit for England website (13). The Midlands HSE data were benchmarked against Primary Care Trust data (means, lower and upper

quartiles) from the National Diabetes Audit for England, 2003–2004 report.

Results

Of the total 947 patients included in the audit, 95 (10%) had type 1, 850 (90%) had type 2, and there were two patients (0.2%) with gestational diabetes. The latter patients, those with gestational diabetes, were excluded from further analyses. Thus, the findings presented hereafter refer to patients with type 1 and type 2 diabetes ($n = 945$), of whom 490 (51.9%) were males. There were 181 patients diagnosed with diabetes during the year preceding the audit (19.2% of the total), of whom 176 had type 2 diabetes. The mean (standard deviation [SD]) age of patients participating in the project was 63 (13) years, ranging from 17 to 98 years; patients with type 2 diabetes were on an average 10 years older than those with type 1 diabetes: mean (SD) age 64.0 (12.1) versus 53 (15.3). Figure 1 shows the patients' age distribution by type of diabetes and gender. Fifty per cent were in the 45–64-year age category, 49.7% were in the 65–84-year age category, and approximately 3% were 85 years or older.

General practice and hospital outpatient visits

Patients with type 1 and type 2 diabetes had a similar number of general practice visits for diabetes in the year preceding the audit, a median of four visits. Only 2.1% of type 1 and 2.8% of type 2 patients had not attended their general practitioner in the year before the audit. As expected, the pattern of hospital outpatient visits varied with type of diabetes, with higher rates of attendance (median) for patients with type 1 diabetes (1 visit) than for those with type 2 diabetes (0.5 visits); 50% of type 2 patients had no hospital outpatient visits in the year preceding the audit versus 29% of those with type 1 diabetes ($p = 0.0001$). Approximately 25% of type 2 patients had two or more outpatient visits versus 46% of those with type 1 diabetes.

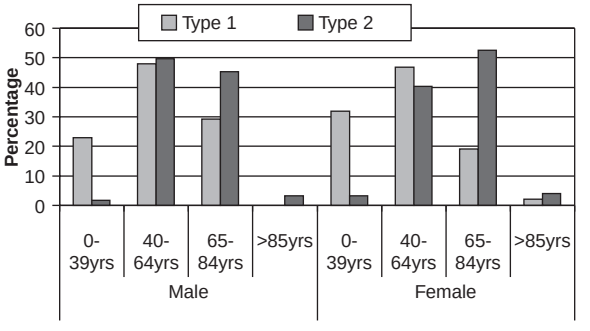

Figure 1. Midland HSE Diabetes Structured Care Project: type of diabetes by gender and age.

Diabetes management

The majority of patients (62.9%) were treated using a combination of diet and oral hypoglycaemic drugs. Only 20% were treated with diet alone. Seventy per cent of patients with type 2 diabetes ($n = 594$) were treated with diet and oral hypoglycaemic drugs, 22% ($n = 188$) with diet alone, 3% with diet and insulin, and the remaining 5% of patients received a combination of diet, insulin, and oral hypoglycaemic drugs. The use of insulin in patients with type 2 diabetes in the Structured Care Project (8%) ranged from 0% to 16.7% across the 20 participating practices.

BMI, smoking prevalence, and alcohol intake

As expected, overweight and obesity were common among patients with diabetes in this audit. Mean (SD) BMI in patients with valid data ($n = 516$) participating in the audit was 30.2 (4.9) kg/m^2. BMI was significantly higher in those with type 2 ($n = 473$) than in those with type 1 diabetes ($n = 43$): 30.6 (4.8) kg/m^2 versus 26.8 (4.3) kg/m^2 ($p < 0.001$). Overall, 37% of patients in the audit met the current criteria for overweight (BMI 25.0–29.9 kg/m^2; 44% of type 1 and 36% of type 2 patients) and 52% met the international criteria for obesity (BMI ≥ 30 kg/m^2; 21% of type 1 and 55% of type 2 patients). A total of 17 patients (all type 2 diabetes) had a BMI ≥ 40 kg/m^2, consistent with morbid obesity on WHO criteria and representing 3.6% of type 2 patients with BMI data recorded.

The overall smoking prevalence was 20.7%, and 45.1% of the patients in the audit consumed alcohol on a weekly basis. Smoking prevalence was higher in patients with type 1 diabetes (30.9%) than in those with type 2 diabetes (19.1%) ($p = 0.06$). However, data were missing for 25% of the entire group ($n = 244$). Only 30 patients reported alcohol consumption levels above current safe-drinking guidelines (14 units/week for women and 21 units/week for men). Patients with type 1 diabetes were more likely than those with type 2 diabetes to exceed safe-drinking guidelines. However, this difference was not statistically significant.

Process-of-care measures and achievement of treatment targets

The major findings on recording process-of-care measures and achievement of core treatment targets are summarized and compared with Primary Care Trust (PCT) data from the National Diabetes Audit for England in Tables I and II. With regard to recording major process-of-care measures and intermediate outcomes of care (achievement of HbA_{1c},

Table I. Recording practices for selected process-of-care measures in the Midlands Structured Care Project (2003 audit) benchmarked against the National Diabetes Audit for England.

	Audit 2003 ($n=945$)		English National Diabetes Audit 2003/04 Primary Care Trust data		
Process-of-care measures	Frequency	%	Mean %	Lower quartile %	Upper quartile %
Blood pressure	933	98.7	86	83	90
HbA_{1c}	896	94.8	76	72	84
Total cholesterol	906	95.9	75	72	83
LDL cholesterol	578	60.8	–	–	–
HDL cholesterol	598	63.3	–	–	–
Triglycerides	853	90.3	–	–	–
Smoking status	701	74.2	70	64	78
Alcohol use	388	41.1			
BMI	517	54.7	72	68	78
Creatinine	775	81.9	75	69	85
Microalbuminuria	540	57.1	21	7	35
Foot assessment	533	56.4	30	18	43
Retinopathy	435	46.0	47	40	58
Management plan	459	48.6	–	–	–
Targets set	426	45	–	–	–

HbA_{1c}: glycosylated haemoglobin; LDL/HDL: low/high-density lipoprotein; BMI: body-mass index.

lipid, and BP targets), the performance of the Midlands Structured Care Project compares well with the data from PCTs in England. With the exception of body-mass index, which was poorly documented in the Midlands Project diabetes records, the level of recording of process-of-care measures was near or above the upper quartile for PCTs in England. For example, blood pressure was recorded in 99% of patients, well above the upper quartile level (90%) for PCTs in England. However, the audit did highlight problems with the quality of the blood pressure data. The BP data displayed marked terminal digit preference, with over 70% of systolic (SBP) and diastolic (DBP) readings recorded to the nearest 10 mm Hg. Twenty per cent of SBP readings were at 140 mm Hg, and 35% of DBP readings were at 80 mm Hg. With regard to intermediate outcomes of care, the proportion of patients with HbA_{1c} concentrations at target levels ($<6.5\%$) in the Midlands HSE project (26.8%) was virtually identical to the upper quartile level for PCTs in England (27.4%). The proportion of patients reaching target total cholesterol levels (<5.0 mmol/l) (54.6%) was close to the mean for PCTs in England (56.6%), and performance with regard to target blood pressure levels was equally poor in both the Midlands HSE and in PCTs in England (Table II).

Discussion

At the heart of quality assurance and quality improvement in healthcare is a striving for excellence through a process of open, critical reflection on practice. This paper provides an overview of the performance of the Midlands HSE Diabetes Structured Care Programme, the first structured-care programme to be implemented in the Republic of Ireland. Using Cochrane Effective Practice and Organization of Care taxonomy (14), the major quality improvement strategies implemented in this programme to date include: team changes (increased involvement of practice nurses in diabetes care), clinician education, and audit and feedback. While the findings are of particular interest in the context of the Irish healthcare system, there is a need to document and share experiences in the management of diabetes internationally, given the difficulty of achieving acceptable quality of care for patients with diabetes worldwide and the importance of learning from experience both within and across health systems.

As expected, problems with the quality of care were highlighted in this audit, in particular poor documentation of body-mass index, terminal digit preference in the blood pressure data, and low rates of insulin use in the management of type 2 diabetes. However, the overall performance of the structured-care programme compares well with that of Primary Care Trusts in England, given the limited resources invested in the project. While difficult to make direct comparisons between the resources available to the Midlands HSE Diabetes Structured Care Programme and those available to Primary Care Trusts in the UK during the same time period (2003/2004), it is reasonable to conclude that the resources available to the Midlands Programme were considerably less that those in the UK. For instance, during this period, practices participating in the Midlands HSE Structured Care Programme did not have IT

Table II. Achievement of core treatment targets in the Midlands Structured Care Project (2003 audit) benchmarked against the National Diabetes Audit for England

		Audit 2003 ($n=945$)		English National Diabetes Audit Primary Care Trust data		
Care process type	Treatment target	Frequency	%	Mean %	Lower quartile %	Upper quartile %
HbA_{1c}	<6.5%	240	26.8	23.0	17.0	27.4
	≥6.5% and ≤7.5%	245	27.3	33.2	31.5	35.6
	>7.5%	411	45.9	43.8	38.3	49.6
Total cholesterol	<5 mmol/l	495	54.6	60.9	56.6	64.6
	≥5 mmol/l	411	45.4	39.1	35.4	43.4
Blood pressure	≤135/75 mm Hg	168	18.0	20.8	19.1	22.3
	≥140/80 and <160/100 mm Hg	587	62.9	63.3	62.5	64.5
	≥160/100 mm Hg	178	19.1	15.9	14.2	17.8

HbA_{1c}: glycosylated haemoglobin.

support to record routine data on patients with diabetes. The input of diabetes nurse specialists and other clinical support staff was also well below that of the UK. The findings from this audit are consistent with trial data on the positive impact of multifaceted interventions directed at general practitioners in the management of type 2 diabetes (9) and with a meta-regression analysis of the effects of quality improvement strategies for type 2 diabetes on glycaemic control (14). It is noteworthy that, in the latter study (14), the evidence for the effectiveness of team change as a quality improvement strategy was particularly strong. Further improvement in the performance of the Midlands HSE Diabetes Structured Care Programme can be anticipated with additional investment in the programme, including resources for the development of IT systems supporting recall and reminder systems, further staff development, and patient education.

There is considerable evidence from the international literature that care for patients with diabetes can be improved (1–4). It is clear that a substantial proportion of patients with type 1 and type 2 diabetes managed in primary care and secondary care environments are not receiving care in accordance with published guidelines (2). The organization of services for people with diabetes is complex, involving hospital-based diabetes teams, primary care teams, community services, patients and their families. The most appropriate model of care for people with diabetes is not readily apparent given the dearth of effectiveness data on the relative performance of different models of care. This reflects the difficulty of obtaining unequivocal experimental evidence on the impact of complex health system interventions in real-world conditions (10,14) and the lack of interest and investment in health systems research (15). There is also the need to adapt models of care for chronic illness to local circumstances and health system culture.

The Midlands HSE Diabetes Structured Care Programme evolved in the specific context of a region which did not have access to a local specialist diabetes unit. However, it is not suggested that this is the ideal model; nor is it suggested that there is a tension between the development of structured diabetes care programmes in the community and the need to resource hospital-based diabetes services providing specialist secondary and tertiary care referral services. The key issue is whether care for the majority of the estimated 130 000 patients with diabetes in Ireland should be anchored in the community or in hospital-based settings. In the absence of clear evidence for the superiority of hospital-based care, there is a compelling case for anchoring care in the community, specifically in well-resourced primary care networks offering structured care and supported by local specialist diabetes units.

Conclusions

The findings from this review of the performance of the Midlands HSE Diabetes Structured Care Programme suggest that primary-care-led structured care provides a viable option for health systems dealing with the challenge of improving the quality of care for patients with diabetes. With limited but well-focused investment, a level of quality can be achieved comparable with other systems, such as the system in the UK, with greater resources.

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References

1. Glasgow RE, Hiss RG, Anderson RM, Friedman NM, Hayward RA, Marrero DG, et al. Report of the health care delivery work group: behavioural research related to the establishment of a chronic disease model for diabetes care. Diabetes Care 2001;24:124–30.
2. Saaddine JB, Engelgau MM, Beckles GL, Gregg EW, Thompson TJ, Narayan KM. A diabetes report card for the United States: quality of care in the 1990s. Ann Intern Med 2002;136:565–74.
3. Vrijhoef HJ, Spreeuwenberg C, Eijkelberg IM, Wolffenbuttel BH, van Merode GG. Adoption of disease management model for diabetes in region of Maastricht. BMJ 2001;323: 983–5.
4. Cheah J. Chronic disease management: a Singapore perspective. BMJ 2001;323:990–3.
5. Renders C, Valk G, Griffin S, Wagner E, van Eijk J, Assendelft W. Interventions to improve the management of diabetes mellitus in primary care, outpatient and community settings. The Cochrane Database of Systematic Reviews; 2000.
6. Griffin S, Kinmonth A. System for routine surveillance for people with diabetes mellitus. The Cochrane Database of Systematic Reviews; 1998.
7. Smith S, Bury G, O'Leary M, Shannon W, Tynan A, Staines A, et al. The North Dublin randomized controlled trial of structured diabetes shared care. Fam Pract 2004;21:39–45.
8. Bodenheimer T, Wagner EH, Grumbach K, Bodenheimer T, Wagner EH, Grumbach K. Improving primary care for patients with chronic illness: the chronic care model, part 2. JAMA 2002;288:1909–14.
9. Olivarius NF, Beck-Nielsen H, Andreasen AH, Horder M, Pedersen PA. Randomised controlled trial of structured personal care of type 2 diabetes mellitus. BMJ 2001;323: 970–5.
10. Renders C, Valk G, Griffin S, Wagner E, van Eijk J, Assendelft W. Interventions to improve the management of diabetes mellitus in primary care, outpatient and community settings. The Cochrane Database of Systematic Reviews; 2000.
11. Brennan C, De La Harpe D, Harkins V. Audit report of the Midlands Health Board Diabetes Shared Care Project 1998–1999. Midland Health Board; 2000.
12. WHO. Definition, diagnosis and classification of diabetes mellitus and its complications. Geneva: World Health Organisation; 1999.
13. National Diabetes Audit. The National Clinical Audit Support Programme (NCASP). Audit report for period 2003/2004. Available at URL: http://www.icservices.nhs.uk/ncasp/pages/audit_topics/diabetes/default-new.asp (accessed January 2007).
14. Shojania KG, Ranji SR, McDonald KM, Grimshaw JM, Sundaram V, Rushakoff RJ, et al. Effects of quality improvement strategies for type 2 diabetes on glycemic control: a meta-regression analysis. JAMA 2006;296:427–40.
15. The Mexico statement: strengthening health systems. Lancet 2004;364:1911–2.