

Features of primary care associated with variations in process and outcome of care of people with diabetes

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SUMMARY

Background: There is now clear evidence that tight control of blood glucose and blood pressure significantly lowers the risk of complications in both type I and type II diabetes. Although there is evidence that primary care can be as effective as secondary care in delivering care for people with diabetes, standards in primary care are variable. Previous studies have shown that practice, patient or organisational factors may influence the level of care of patients with diabetes. However, these studies have been conducted in single geographical areas and involved only small numbers of practices.

Aim: To determine the standard of diabetes care in general practice and to determine which features of practices are associated with delivering good quality care.

Design of study: A questionnaire survey and analysis of multi-practice audit data.

Setting: Three health authorities in England, comprising 169 general practices.

Method: This study was conducted with a total population of 1 182 872 patients and 18 642 people with diabetes. Linkage analysis was carried out on data collected by a questionnaire, routinely collected health authority data, and multi-practice audit data collected by primary care audit groups. Practice annual compliance was measured with process and outcome measures of care, including the proportion of patients who had an examination of their fundi, feet, blood pressure, urine, glycated haemoglobin, and the proportion who had a normal glycated haemoglobin.

Results: Median compliance with process and outcome measures of care varied widely between practices: fundi were checked for 64.6% of patients (interquartile range [IQR] = 45.3–77.8%), urine was checked for 71.4% (IQR = 49.7–84.3%), feet were checked for 70.4% (IQR = 51.0–84.4%), blood pressure for 83.6% (IQR = 66.7–91.5%), and glycated haemoglobin was checked for 83.0% of patients (IQR = 69.4–92.0%). The glycated haemoglobin was normal in 42.9% of patients (IQR = 35.0–51.2%). In multiple regression analysis, compliance with measures of process of care were significantly associated with smaller practices, fundholding practices, and practices with a recall system. Practices with more socioeconomically deprived patients were associated with lower compliance with most process measures. Practices with a greater proportion of patients attending hospital clinics had lower compliance with process and outcome measures. Being a training practice, having a diabetes mini-clinic, having more nurses, personal care, and general practitioner or nurse interest in diabetes were not associated with compliance of process or outcome of care.

Conclusions: Despite recent evidence that complications of diabetes may be delayed or prevented, this study has highlighted a number of deficiencies in the provision of diabetes care and variations in care between general practices. Provision of high quality diabetes care in the United Kingdom will present an organisational challenge to primary care groups and trusts, especially those in deprived areas.

Keywords: diabetes mellitus; multi-practice audit; process of care; outcome of care; variations in care.

Introduction

THERE is now clear evidence that tight control of blood glucose significantly lowers the risk of microvascular complications in both type I and type II diabetes.² Tight blood pressure control also reduces the risk of macrovascular complications in type II diabetes.^{3,4} Although there is evidence that primary care can be as effective as secondary care in delivering care for people with diabetes,⁵ standards in primary care are variable. At the same time, there has been an increase in the proportion of patients being reviewed solely in primary care⁶ and therefore methods are needed for reducing the variability in these standards. The NHS Executive has issued a guideline against which health authorities can assess the quality of service provided locally⁷ and many general practices have taken part in audit of diabetes care. Audit of diabetes care has been common in general practice because this has been a requirement since the introduction of the chronic disease management programme.⁸ Consequently, diabetes has been the commonest topic of multi-practice audit since 1991.⁹

Audits have confirmed wide variations in care of patients with diabetes between practices¹⁰ and between different health districts.¹¹ Previous studies have shown that practice, patient or organisational factors may influence the level of care of patients with diabetes.^{10,12} However, these studies have been conducted in single geographical areas and involved only small numbers of practices.^{10,12} The social and demographic characteristics of general practice populations may also help to explain some of the variations seen in the care of patients with diabetes and in the performance of general practitioners (GPs);¹³ however, such studies have not been conducted. In the United Kingdom (UK), new national strategies for public health have been drawn up to tackle inequalities with the aim of improving the health of the most deprived, in order to narrow the health gap.¹⁴ When inequalities are identified, purchasers should undertake audits with providers to determine the appropriateness of care received by their residents.¹³

To improve care, information is required on the obstacles to change faced by practices. Data about the populations served by individual practices are required to improve current understanding of patient and practice characteristics that influence why compliance with process and outcome measures vary so widely between general practices. It is possible to collate audit data from a large number of audit groups from different health regions and to use this method for describing patterns of care.¹¹ The aim of this study was to collate individual practice level data from practices that had taken part in a multi-practice audit to determine the

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HOW THIS FITS IN*What do we know?*

There is wide variation between practices in the proportions of people with diabetes who receive routine examinations. Previous studies in individual localities have related patient, practice, and organisational factors to the level of performance.

What does this paper add?

Practices with more highly deprived patients performed less well. Fundholding practices, practices with recall systems, and smaller practices performed more highly for some aspects of care. Less than half of people with diabetes had good glycaemic control.



standard of diabetes care in primary care. A further aim was to determine which features of practices are associated with delivering good quality care.

Method*Audit data*

A list of audit groups that had conducted a multi-practice audit of diabetes was available from a recent study.¹¹ The inclusion criteria for this study were audits conducted by audit groups that had:

- conducted a systematic multi-practice audit of diabetes;
- used the same evidence-based protocol with prioritised evidence-based criteria;¹⁵
- given clear instructions on using multiple methods to develop a register of patients with diabetes;
- given clear instructions on data collection and had analysed the data for the practices;
- given individualised feedback of the results and conducted a second data collection; and
- data available for individual practices.

Three audit groups from different districts in England (Leicestershire, Durham, and Suffolk) met the inclusion criteria and were selected to take part in this study. Two audit groups had selected every patient with diabetes in the practice and one audit group had used systematic sampling for a small number of their practices.¹⁶

Data for practices that had conducted at least one data collection were obtained from the three audit groups for this study. Data were obtained at individual practice level (either on paper or computer disk). The audit groups had recorded that the process or outcome data were complied with if they were recorded in the notes. Missing data were coded as 'criteria not complied with'. Details regarding the confidentiality, coding, and content of data collection have been described previously.¹¹

Identification of factors relating to good quality of care of people with diabetes

A number of factors that might possibly be associated with good quality care of people with diabetes were identified by a combination of methods that included 'brain-storming',

focus groups, key informant techniques, and a literature review.¹⁷ Data about the presence or absence of these factors were obtained by a questionnaire survey of all practices ($n = 327$) in the three health authorities and from routine general practice data held by the three health authorities.

Questionnaire survey

The questionnaire was developed and piloted in eight practices, following which a small number of minor alterations were made to its wording. The final version consisted of 20 questions, the majority of which were closed. The questionnaire was sent in 1997 to all practices in the three health authorities. It was addressed to the practice nurse or the practice manager with instructions that the information for answering some questions should be obtained from GPs in the practice. Non-responders were sent a reminder after three weeks, and those still not responding were telephoned.

Health authority data

The three health authorities provided data about practice characteristics relating to 1996 for all general practices, including list size, number of partners, fundholding status, Jarman score, Townsend score, training status, and the number of whole time equivalent (WTE) nurses.

The factors about which information was sought from the audit group, the health authority, and the practice questionnaire survey are listed in Box 1. Ethical approval was granted from all three local research ethics committees and responders were assured of confidentiality.

Data analysis

Analysis was carried out using SPSS for Windows (version 8). Associations between variables were sought using χ^2 tests for categorical variables and t-tests for continuous variables. Multiple regression was employed to determine which factors were independently associated with compliance with the measures of the process and outcome of care. Variables were included if there was a significant association in univariate analysis at a significance level of 0.05 or if they were likely confounders. Explanatory variables were tested in a forward stepwise regression analysis.

Results

The three health authorities were responsible for 327 practices (numbers of practices in each health authority: 87, 88, and 152) of which 264 responded to the questionnaire survey (mean response rate = 81%; range between health authorities = 70–91%). Two practices refused to participate and 61 failed to reply. One hundred and sixty-nine practices (51%; proportion taking part in each health authority: 44%, 52%, and 64%) had conducted an audit of people with diabetes of which 83% (149 out of 169) responded to the questionnaire. Table 1 shows the characteristics of the practices that participated in the multi-practice audits with comparable figures for England.

The crude prevalence of diabetes could be ascertained for 154 practices and was calculated as 1.7%.¹⁸ As the taxonomy of shared care is not clear,⁵ delivery of care was defined

Audit Group	Practice	Health Authority
Process of care data	Recall system	Jarman Score
Annual compliance with fundi check	Diabetes mini-clinic	Townsend Score
Glycated Hb check	Presence of a dietician	List size
Foot check	GP interest in diabetes	Number of partners
BP check	GP course in diabetes	WTE nurses
Urine check	Nurse interest in diabetes	Practice manager
	Nurse course	Training status
	Presence of protocol/guideline	Fundholding status
<i>Outcome of care data</i>	Presence of glucometer	
Proportion of patients with a normal glycated haemoglobin ^c	Personal list system	

Box 1. Information obtained from audit groups, health authorities, and the practices. ^aFor practices that had conducted a multi-practice audit. ^bFor all practices that responded to the questionnaire survey. ^cSince normal ranges for glycated haemoglobin vary between different centres,¹ the cut-off for the respective local laboratories was taken as normal.

Table 1. Characteristics of practices that participated in the multi-practice audit compared with England.^a

Practice characteristic	Multi-practice audit practices	England
Number of partners		
Single-handed	17.0%	30.5%
2–6 partners	74.5%	63.9%
>7 partners	8.4%	5.6%
Average list size per partner	1862	1885
Training practice	26.3%	23%
Fundholding ^b	34.9%	41%
Approved for chronic disease management (diabetes)	99.4%	94%
Mean Jarman score (range) ^c	2.4 (-37.3–42.3)	0 (-45.5–66.0)
Mean Townsend score (range) ^c	0.4 (-5.8–9.7)	0 (-8.8–13.7)

^aGeneral Medical Statistics, NHSE, 1997. ^bNHS Annual Report 1995–1996, NHS Executive, Leeds, 1996. ^cJarman and Townsend scores for electoral wards in England were supplied by the Office for National Statistics.

as either general practice care or hospital care. A total of 169 practices supplied data relating to 18 642 people with diabetes: 5760 (30.9%) were under hospital care and 11 155 (59.8%) were under general practice care. The source of care was not known for 1727 (9.3%) patients. Table 2 shows the levels of compliance with the process and outcome measures.

Table 3 shows the multiple regression analysis of factors associated with levels of compliance with measures of process and outcome. The results show that practices with a smaller proportion of patients under hospital care are associated with higher compliance with process and outcome of care. Fundholding practices and practices with a recall system are associated with annual compliance of some process measures. Smaller practices have higher compliance with annual assessment of glycated haemoglobin and blood pressure. Practices with higher socioeconomic deprivation performed poorly for most process measures. Having a check for blood pressure and having a foot check had high association with practice factors. Intermediate outcome of care was only associated with the proportion of patients under hospital care but only a small degree (2.4%) of variance can be explained by this. There was no association between the percentage of patients who had glycated haemoglobin checked in each practice and the percentage who had a normal glycated haemoglobin (β -coefficient 0.13; 95% confidence interval = -0.09–0.34). Being a training practice, having a diabetes mini-clinic, having more nurses, personal care, and general practice or nurse interest in diabetes was not associated with compli-

ance with measures of process or outcome of care. The other models for process measures in Table 3 only explained a small proportion of the variability.

Discussion

This study reports on the compliance with measures of process and outcome of care for diabetes in 169 practices in three different geographical areas. The large numbers of practices from three geographical regions, unlike previous studies,^{10,12} is likely to give a more complete picture of the care of people with diabetes in the UK.

Limitations of the study

The response rate for the questionnaire survey was over 80% which is excellent for general practice questionnaires. However, since the questionnaires were self-completed the responses to some questions should be interpreted with caution. The record review was conducted by the practices and the accuracy of the diabetes registrar data extraction has not been confirmed. However, this is normal for these types of multi-practice audits.¹⁹ Furthermore, it is possible to compile a diabetes register in a district using only general practice registers.²⁰ A combination of methods was used for case ascertainment, including practice disease registers, drug registers, and opportunistic identification of cases. The validity of data is supported by the ascertainment rate of diabetes compared with other studies²¹ and the prevalence of diabetes of 1.7% compares well with rates found in other recent studies.^{22,23} The proportions of patients being cared

Table 2. Annual compliance with process and outcome of care in the previous 12 months.

	Number of practices	Number of people with diabetes	Percentage median compliance of practices (interquartile range)
Fundi checked	160	18 746	64.6 (45.3–77.8)
Urinanalysis checked	162	18 381	71.4 (49.7–84.3)
Feet checked	162	18 504	70.4 (51.0–84.4)
Blood pressure checked	105	13 352	83.6 (66.7–91.5)
Glycated haemoglobin checked	165	19 174	83.0 (69.4–92.0)
Glycated haemoglobin normal	123	9 665	42.9 (33.0–51.2)

Table 3. Coefficients of estimated regression models (95% confidence intervals) for annual compliance with process and outcome of care.

	Glycated haemoglobin checked	Fundi checked	Urine checked	Feet checked	Blood pressure checked	Glycated haemoglobin normal ^a
Fundholding practice	-	-	9.5 (1.4 to 17.6)	9.4 (1.7 to 17.1)	-	-
Training practice	-	-	-	-	-	-
Recall system	-	25.6 (2.9 to 48.9)	-	33.9 (10.5 to 57.2)	-	-
Diabetes mini-clinic	-	-	-	-	-	-
List size in 1000s	-1.1 (-1.8 to -0.38)	-	-	-	-1.7 (-2.6 to -0.8)	-
Total number of GPs	-	-	-	-1.9 (-3.7 to -0.2)	-	-
WTE nurse	-	-	-	-	-	-
Jarman score	-	-	-	-	-	-
Townsend score	-1.6 (-2.6 to -0.6)	-1.3 (-2 to -0.03)	-	-2.0 (-3.3–0.8)	-1.2 (-2.3 to 0.0)	-
Prevalence of diabetes	-6.3 (-10.7 to -1.9)	-	-	-	-	-
Patients under GP care	-	-	-	-	-	-
Patients under hospital care	-0.3 (-0.5 to -0.2)	-0.5 (-0.7 to -0.3)	-0.5 (-0.7 to -0.3)	-0.3 (-0.5 to -0.1)	-0.4 (-0.6 to -0.2)	-0.2 (-0.4 to -0.002)
Personal care ^b	-	-	-	-	-	-
GP interest in diabetes	-	-	-	-	-	-
Nurse interest in diabetes	-	-	-	-	-	-
Adjusted R ² (%)	17.7	14.8	13.9	20.9	27.4	2.4

^aPresence of a practice-based dietician used in the model but this was not significant. ^bPersonal care defined as practice being single-handed or having a personal list system.

for in general practice, hospital, and shared care are comparable with other studies of people with diabetes.^{24–26} A further reservation is that the practices that took part in this multi-practice audit were self-selected. Although single-handed practices were under-represented, the sample of practices was generally typical of all practices in England.

Quality of care

The quality of care in our study is comparable with other similar surveys.^{10,27} However, these studies were carried out in single geographical regions and they usually reported very little information about the participating practices. Despite recent evidence that complications of diabetes may be delayed or prevented,^{2,4} this study has highlighted a number of deficiencies in the provision of diabetes care and variations in care between practices and between different regions. Previous studies have shown that the glycated haemoglobin is within the normal range in 10% to 15% of patients.^{28,29} Our study shows that the proportion of patients with a normal glycated haemoglobin is better but still unsatisfactorily low. Our study failed to find an association between process of care and intermediate outcome of care.

Variations in care

Many factors influence care and studies that investigate individual factors often fail to show substantial effects;¹² howev-

er we identified a number of practice and patient factors from the literature that were included in the analysis. The large variations between the 165 practices in compliance with measures of process and outcome of care are of concern. Our study found that poorer achievement of process and outcome measures were associated with increased proportions of patients cared for in secondary care. This could be a result of case mix, with severely ill patients being followed up in secondary care, or a result of poor exchange of information with data not being conveyed to practices. A recent meta-analysis showed that structured diabetes care involving centralised recall systems can achieve good outcomes.⁵ However, our study shows that having a recall system is only associated with improved annual assessment of feet and fundi, rather than producing an improved outcome.

This is the first study that has investigated whether prevalence is related to variations in delivery of diabetes care in general practice. In multivariate analysis, a higher prevalence of diabetes was negatively associated with only one process measure (the proportion having an annual check for glycated haemoglobin). Therefore, association between deprivation and quality of care is unlikely to be owing to high morbidity.

Our study failed to find an association between personal care and quality of diabetes care. However, this may be explained by the lower participation rates from smaller practices. Recent studies have shown the existence of an inverse

socioeconomic mortality gradient in diabetic people.^{30,31} Our study shows that the quality of care of people with diabetes in deprived areas tends to be lower than the quality of care of people in more advantaged areas, which may help to explain the cause of this mortality gradient. The models we used in this study explained only a small proportion of the variations in the care of patients with diabetes. This study therefore shows that diabetes care is complex¹⁷ and variations in care are also owing to other unmeasured factors.

Implications

Our study shows that the current management of diabetes in primary care is failing to provide effective care for a large proportion of people with diabetes. Less than half of the patients with diabetes have good glycaemic control, which is particularly disturbing in the light of recent evidence. Whether the current payment for chronic disease management reflects the effort required to provide high quality care is open to question. Provision of diabetes care in the UK will present a major organisational challenge to the primary care groups and trusts, especially those in deprived areas.

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