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Quality of diabetes care in patients with schizophrenia and bipolar disorder: cross-sectional study

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Abstract

Aims To determine whether patients with severe mental illness receive poorer health care for diabetes than patients without.

Methods This population-based cross-sectional survey used electronic general practice records from 481 UK general practices contributing to the QRESEARCH database. The records of 11 043 patients with diabetes, drawn from a database population of over 9 million patients, were extracted. Unadjusted and adjusted odds ratios were calculated using unconditional logistic regression for each of 17 quality indicators for diabetes care from the new General Medical Services contract for general practitioners.

Results The presence of severe mental illness did not reduce the quality of care received; the only significant difference between groups showed that such patients were more likely to have glycated haemoglobin < 7.5% [adjusted odds ratio = 1.45 (99% confidence interval 1.20–1.76)]. Increasing age was associated with better care [adjusted odds ratios from 1.06 (1.02–1.11) to 1.61 (1.52–1.70)], but other confounding variables had no consistent effect across indicators. Overall, performance against government targets was good.

Conclusions The hypothesis of poorer diabetes care for those with severe mental illness is disproved, perhaps surprisingly, in the light of other recent UK studies showing inequalities in care for the mentally ill. The study does not reveal who is providing this good care (general practitioners, psychiatrists or diabetologists) or take account of the estimated 600 000 people in the UK with undiagnosed diabetes.

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Keywords diabetes, mental health, quality, treatment

Abbreviations EMIS, Egton Medical Information Systems; GMS, General Medical Services; GP, general practitioner; HbA_{1c}, glycated haemoglobin; nGMS, new contract for the provision of General Medical Services; OR, odds ratio

Introduction

People with severe mental illness have poorer physical health, and are more likely to die early from a physical illness, than the general population [1]. Schizophrenia and other types of severe mental illness are associated with increased rates of most common medical conditions [2], a higher prevalence of obesity [3] and a greater rate of tobacco smoking [4]. People with schizophrenia appear less likely to spontaneously report symptoms of physical ill health [5], and their physical illnesses often go unrecognized by medical and other professional staff [6]. Mental health service users report difficulties in accessing physical health care, and feel that their physical health problems are often not taken seriously by professionals [7]. Low self-esteem, communication difficulties, apathy and disorganization may all contribute to the difficulties that face this group of patients in obtaining medical care [8].

The association between severe mental illness and diabetes is now widely recognized. A recent consensus meeting concluded that the overall risk of Type 2 diabetes in people with schizophrenia is 2–4 times that of the general population, with a prevalence of approximately 15–18%, and that impaired glucose tolerance may affect up to 30% of people with schizophrenia [9]. Similar findings have been reported in patients with bipolar affective disorder [10].

There are historical reports of an increased prevalence of hyperglycaemia and diabetes in people with mental disorders, including schizophrenia [11–13]; the introduction of chlorpromazine produced further reports [14], as did the use of atypical

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antipsychotic treatments [15]. The relative influences of medication, lifestyle, obesity and underlying metabolic factors are still not clear.

In the USA, researchers have compared the diabetes care received by patients with and without mental disorders. Those with a mental disorder were found to be less likely to have received recommended screening and preventive services [16–18], to be more likely to have diabetic complications [19], and to have less knowledge about their diabetes [20]. Paradoxically, however, one US study has shown that diabetic patients with severe mental illness had better glucose control [as measured by glycated haemoglobin (HbA_{1c})] than those without [21]. In the UK, no published studies have specifically examined the diabetes care of patients with severe mental disorders, but it is known that quality-of-care targets for diabetes are less likely to be reached in areas of high deprivation and high ethnicity [22]. Recent studies in the UK have, however, demonstrated inequalities in other areas of health care in patients with mental illness [23].

Patients and methods

This study, related to a series of studies commissioned by the UK Disability Rights Commission, tests the hypothesis that the physical health care received by patients with diabetes and severe mental illness is less good than the care received by patients with diabetes who do not have severe mental illness.

Participants

The study used the QRESEARCH database, which is derived from the computerized health records of general practices using the Egton Medical Information Systems (EMIS) system [24]. The full database currently contains aggregated data on 9.2 million patients from 481 representative [25] general practices across the UK and contains information on patient demographics, diagnoses, clinical values, laboratory investigations, prescriptions, consultations and referrals. The two study samples described below were drawn from those patients in the database whose general practitioners (GPs) had entered complete data for the whole of the 3-year period, 1 April 2002 to 1 April 2005, and who were aged over 16 years and registered (other than temporarily) with their GP on 1 April 2005. This is shown in the flowchart.

The severe mental illnesses studied were schizophrenia and bipolar disorder; in this paper, the term 'mental illness' refers to these two conditions. Patients' diagnoses were determined using the standard 'Read' computer codes for diagnoses of diabetes mellitus, schizophrenia and bipolar disorder (a full list of codes, developed in consultation with GPs with an interest in the field, is available from the authors; these codes are entered by patients' GPs when they make their clinical notes of the consultation). Data were extracted for all patients with a diagnosis of diabetes and of either schizophrenia or bipolar disorder. Data were also extracted for a randomly selected sample of patients with diabetes but neither of these mental illnesses. Diagnoses were included whether they were coded as active or inactive, current or past, because the 'inactive' and 'past' codes were not reliably or consistently used by those entering data. (The validity of this method of picking up cases of diabetes has been tested by comparing rates with those found in other studies, and has been shown to correspond well [26].)

Statistical methods

Using SPSS version 13 [27], basic descriptive statistics and unadjusted and adjusted odds ratios (ORs) with 99% confidence intervals were calculated using unconditional logistic regression for each of the 17 quality indicators for diabetes in the new General Medical Services contract for UK general practitioners (nGMS) [28], which provides financial incentives for meeting a variety of selective-population health targets, and for recording data related to these targets (see Table 1).

Our key outcome of interest was the adjusted comparison between patients with and without schizophrenia or bipolar disorder. In the adjusted analysis, the effects on differences between these groups of several potential confounding variables were estimated. These were deprivation, as measured by quintile of Townsend score (a proxy for material deprivation); rural or urban location; geographical region of England; age, analysed in 10-year bands; and sex. Comparisons could only be made for English regions because there were too few subjects in the sample from Wales, Northern Ireland or Scotland for a valid analysis to be made. Statistical significance was taken as $P < 0.01$, with corresponding 99% confidence intervals, because of the large number of comparisons being made.

Results

Participants

A total of 481 practices provided complete data from 1 April 2002 to 1 April 2005. There were 3 563 482 patients aged > 16 years permanently registered at these practices on 1 April 2005 (see Fig. 1). Of these, 115 131 patients had a computer-recorded diagnosis of diabetes, giving a prevalence of 3.23%.

Amongst these 115 131 patients, 1043 had a diagnosis of either schizophrenia ($n = 705$) or bipolar disorder ($n = 396$; 58 patients had both): these patients formed the first study group. The second study group was formed of 10 000 patients selected at random from the 114 088 patients with diabetes who did not have a diagnosis of schizophrenia or of bipolar disorder.

Fifty-four per cent of the patients were male. Their ages were approximately normally distributed between 17 and 101 years, with a median age of 66 years. Thirty-four per cent of patients were registered with GP practices classified as rural, and 66% with practices classified as urban. Table 2 shows these data, and the rates of deprivation, broken down by the presence or absence of the mental illnesses being studied. The most notable differences between the groups are the much greater rates of deprivation amongst those with mental illness (e.g. 40% of those with mental illness fall in the least affluent quintile, compared with 21% of those without; $\chi^2 = 244.55$, $P < 0.001$), and the concentration of patients with mental illness in urban practices (79% compared with 64%; $\chi^2 = 86.06$, $P < 0.001$).

Table 1 Quality indicators for diabetes from the new contract for the provision of General Medical Services (nGMS) contract

The percentage of patients with diabetes ...	
DM2	... whose notes record BMI in the previous 15 months
DM3	... in whom there is a record of smoking status in the previous 15 months, except those who have never smoked where smoking status should be recorded at least once since diagnosis
DM4	... who smoke and whose notes contain a record that smoking cessation advice has been offered in the last 15 months
DM5	... who have a record of HbA_{1c} or equivalent in the previous 15 months
DM6	... in whom the last HbA_{1c} is ≤ 7.4% (or equivalent depending on local lab) in last 15 months
DM7	... in whom the last HbA_{1C} is ≤ 10.0% (or equivalent depending on local lab) in last 15 months
DM8	... who have a record of retinal screening in the previous 15 months
DM9	... with a record of presence or absence of peripheral pulses in the previous 15 months
DM10	... with a record of neuropathy testing in the previous 15 months
DM11	... who have a record of the blood pressure in the past 15 months
DM12	... in whom the last blood pressure is 145/85 or less
DM13	... who have a record of microalbuminuria testing in the previous 15 months (exception reporting for patients with proteinuria)
DM14	... who have a record of serum creatinine testing in the previous 15 months
DM15	... with proteinuria or microalbuminuria who are treated with ACE inhibitors or A2 antagonists
DM16	... who have a record of total cholesterol in the previous 15 months
DM17	... whose last measured total cholesterol within previous 15 months is 5 mmol/l or less
DM18	... who have a record of influenza vaccination in the preceding 1 September to 31 March

ACE, acetylcholinesterase; BMI, body mass index; DM, diabetes mellitus; HbA_{1c}, glycated haemoglobin.

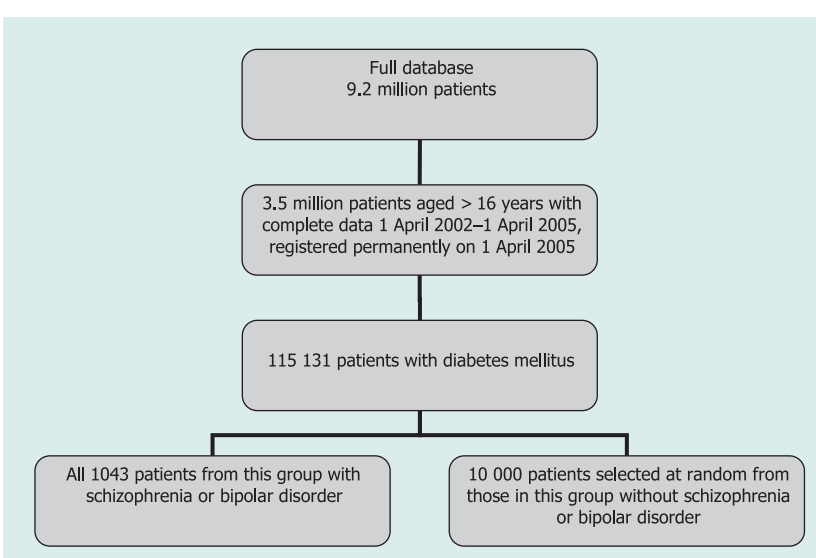

FIGURE 1 Flow chart showing study population and samples.

Data quality

All parameters were available for almost all (> 93%) of the sample. The sample size varied for different indicators, as not all patients were eligible for each indicator: for example, smoking cessation advice (indicator DM4) only applies to patients recorded as current smokers. As a guide, the sample size for DM6 (HbA_{1c}< 7.5%) was 8937. In all cases, the sample size was vastly in excess of the minimum of 400 needed to detect a clinically significant OR of 1.1 on any given quality indicator.

Performance against nGMS targets

Overall, performance on most targets was good, as shown in Table 3. The numbers shown in bold and italics highlight values that are up to 10% and more than 10% respectively below the

Table 2 Characteristics of diabetic patients with and without schizophrenia or bipolar disorder (SMI)

Descriptive characteristics		Total		Patients with SMI		Patients without SMI		X^2	*P*
		n	%	*n*	%	*n*	%		
Sex	Male	5976	54.1%	482	46.2%	5494	54.9%	28.97	< 0.001
	Female	5067	45.9%	561	53.8%	4506	45.1%		
Age (10-year bands)	Median (range)	66 (17 to 101)		62 (23 to 93)		67 (17 to 101)		96.91	< 0.001
Practice	Urban	6745	65.6%	785	78.9%	5960	64.2%	86.06	< 0.001
	Rural	3534	34.4%	210	21.1%	3324	35.8%		
Neighbourhood socio-economic status	Richest 20%	2008	19.0%	100	9.9%	1908	19.9%	244.55	< 0.001
	Second richest 20%	1928	18.2%	108	10.7%	1820	19.0%		
	Middle 20%	2087	19.7%	155	15.3%	1932	20.2%		
	Second poorest 20%	2112	20.0%	242	23.9%	1870	19.5%		
	Poorest 20%	2449	23.1%	407	40.2%	2042	21.3%		

Table 3 General practitioner (GP) performance on diabetes indicators for patients with and without schizophrenia or bipolar disorder

DM	Quality indicator	Number (%) to whom indicator applies		Subjects with mental illness meeting target	Subjects without mental illness meeting target
2	Body mass index recorded	10 755	97%	95%	95%
3	Smoking history recorded	10 939	99%	98%	98%
4	Smoker received advice	1804	16%	97%	96%
5	HbA_{1c} recorded	10 858	98%	96%	97%
6	$HbA_{1c} < 7.5\%$	9625	87%	54%	*47%*
7	$HbA_{1c} < 10\%$	10 153	92%	**75%**	**73%**
3	Retinal screening carried out	10 566	96%	*88%*	*88%*
9	Pulses checked	10 544	95%	*88%*	*86%*
10	Neuropathy test carried out	10 538	95%	*87%*	*87%*
11	Blood pressure recorded	10 947	99%	99%	98%
12	Blood pressure < 130/85 mmHg	10 270	93%	77%	74%
13	Microalbuminuria testing carried out	10 185	92%	**80%**	*82%*
14	Creatinine recorded	10 901	99%	96%	96%
15	On ACE and prot or micro	785	7%	90%	87%
16	Cholesterol recorded	10 858	98%	95%	96%
17	Cholesterol < 5 mmol/l	9949	90%	72%	75%
18	Flu vaccination carried out	9479	86%	86%	87%

ACE, acetylcholinesterase; DM, diabetes mellitus; HbA_{1c}, glycated haemoglobin; prot, proteinuria; micro, microalbuminuria.
Numbers in bold are more than 10% below the performance target; numbers in italics are up to 10% below the performance target.

government's top performance target for that indicator (that needed for achievement of maximum nGMS points). The numbers for the mental illness and non-mental illness groups are not significantly different ($\chi^2 = 0.01$, $P = 1.00$, d.f. = 16).

Effect of schizophrenia and bipolar disorder on quality of diabetes care

The presence of these mental illnesses did not affect the quality of diabetes care received by study subjects. As shown in Table 4, the only significant difference was that patients with mental illness were more likely to have an $HbA_{1c} < 7.5\%$ recorded (i.e. to have a better outcome on this indicator). This was true both in the unadjusted analysis [OR = 1.34 (1.11–1.62)] and when potential confounders such as age, sex, deprivation and rural/urban location were taken into account [adjusted OR = 1.45 (1.20–1.76)].

Effect of potential confounders

Increasing age was associated with better diabetes care. For all quality indicators, except numbers 2, 4, 12 and 15, every 10-year increase in age increased the odds of meeting the target between an adjusted odds ratio of 1.06 (1.02–1.11) for $HbA_{1c} < 10.0\%$ (indicator DM7), and one of 1.61 (1.52–1.70) for having creatinine recorded (DM14). The effect of age was highly

Table 4 Unadjusted and adjusted logistic regression results for the presence of schizophrenia or bipolar disorder (SMI)

DM	Quality indicator	SMI vs. no SMI unadjusted			SMI vs. no SMI adjusted			Adjusted *R* squared
		Odds ratio	99% CI		Odds ratio	99% CI		
2	Body mass index recorded	0.93	0.63	1.36	0.96	0.65	1.43	0.01
3	Smoking history recorded	1.31	0.67	2.57	1.41	0.71	2.81	0.04
4	Smoker received advice	1.52	0.60	3.86	1.34	0.51	3.49	0.03
5	HbA_{1c} recorded	0.83	0.53	1.29	0.93	0.59	1.47	0.03
6	$HbA_{1c} < 7.5\%$	1.34	**1.11**	**1.62**	1.45	**1.20**	**1.76**	0.04
7	$HbA_{1c} < 10\%$	1.12	0.91	1.38	1.17	0.95	1.45	0.02
8	Retinal screening carried out	0.99	0.75	1.30	1.12	0.84	1.49	0.01
9	Pulses checked	1.15	0.87	1.51	1.27	0.96	1.68	0.02
10	Neuropathy test carried out	0.95	0.73	1.23	1.08	0.83	1.42	0.02
11	Blood pressure recorded	1.01	0.50	2.04	1.24	0.60	2.55	0.07
12	Blood pressure < 130/85 mmHg	1.16	0.94	1.43	1.17	0.94	1.44	0.00
13	Microalbuminuria testing carried out	0.88	0.70	1.10	1.06	0.84	1.34	0.07
14	Creatinine recorded	0.91	0.58	1.42	1.09	0.68	1.74	0.09
15	On ACE and prot or micro	1.28	0.44	3.73	1.17	0.37	3.66	0.09
16	Cholesterol recorded	0.89	0.58	1.36	1.02	0.66	1.58	0.05
17	Cholesterol < 5 mmol/l	0.87	0.71	1.07	0.94	0.76	1.16	0.04
18	Flu vaccination carried out	0.90	0.69	1.18	1.03	0.78	1.37	0.11

ACE, acetylcholinesterase; CI, confidence interval; HbA_{1c}, glycated haemoglobin; prot, proteinuria; micro, microalbuminuria; SMI, severe mental illness.
Numbers in bold are significant ($P < 0.01$).

significant overall: $P < 0.001$ for all except the four aforementioned indicators.

Other confounding variables had no consistent effect across the different indicators: see Table 5. The most deprived 20% of the population had poorer odds of having good glucose control [adjusted odds ratio 0.79 (0.65–0.96) for $HbA_{1c} < 7.5\%$ and 0.77 (0.62–0.94) for $HbA_{1c} \leq 10.0\%$], but deprivation was a significant predictor overall only of whether urine was tested for microalbuminuria ($P < 0.001$). Women had better odds than men of having their body mass index (BMI) checked [adjusted odds ratio 1.33 (1.05–1.69)], and of having a total cholesterol < 5.0 mmol/l [adjusted odds ratio 1.61 (1.42–1.83)]. Patients of rural GPs had marginally significantly greater odds of having their peripheral pulses checked [adjusted odds ratio 1.22 (1.00–1.47)].

This was also the case when the different English regions were compared with each other (data not shown; too few data were received from Scotland, Wales and Northern Ireland to make valid comparisons). There were several individual variations between regions—such as greater odds of having an $HbA_{1c} < 7.5\%$ in the North-West [adjusted OR = 1.34 (1.08–1.67)] and North-East [adjusted OR = 2.07 (1.58–2.70)], and of being on an acetylcholinesterase (ACE) inhibitor in East Anglia [adjusted OR = 8.02 (1.12–57.65)], compared with the East Midlands. However, the 99% confidence intervals were mostly very wide and there was no consistent pattern across indicators of any region having better or worse outcomes compared with the others.

Discussion

This study demonstrates that the overall quality of diabetes management in UK primary care was similar for patients with and without schizophrenia or bipolar disorder in the first year following the introduction of the nGMS contract on 1 April 2004. Moreover, results were as good on outcome measures (such as HbA_{1c}) as on process measures (such as whether retinal screening was performed). The contract has provided major financial incentives to provide, and record the provision of, target levels of care; target-related payments now account for approximately 25% of the income of the average practice [29]. Care as measured by these standards has consequently probably improved markedly and this ceiling effect may now make inequalities in care between patient groups more difficult to detect.

This study gives information about levels of care recorded in the computerized primary health-care database, but does not reveal who is providing the good diabetes care to patients with mental illness: it could be GPs, community mental health teams, diabetologists, or some combination of these. Our hypothesis, based on earlier US findings that diabetes care for the severely mentally ill is less good, was disproved. This should be welcomed; the increased incidence and prevalence of diabetes amongst patients with severe mental illness [9] adds to the burden carried by this already vulnerable and stigmatized section of the population, and it is vital that their medical care is as good as that of other patients.

Table 5 Adjusted logistic regression results for potential confounding variables

DM	Quality indicator	Deprivation Significance	Most vs. least deprived			Male vs. female			Rural vs. urban		
			Odds ratio	99% CI		Odds ratio	99% CI		Odds ratio	99% CI	
2	Body mass index recorded	0.137	1.04	0.68	1.57	1.33	**1.05**	**1.69**	1.11	0.83	1.49
3	Smoking history recorded	0.681	0.87	0.45	1.67	0.83	0.57	1.21	1.22	0.76	1.96
4	Smoker received advice	0.622	1.03	0.29	3.72	0.76	0.39	1.50	0.98	0.44	2.18
5	HbA_{1c} recorded	0.824	0.88	0.53	1.47	1.18	0.89	1.58	0.99	0.69	1.42
6	$HbA_{1c} < 7.5\%$	0.029	0.79	**0.65**	**0.96**	1.02	0.92	1.15	1.01	0.89	1.16
7	$HbA_{1c} < 10\%$	0.012	0.77	**0.62**	**0.94**	0.97	0.86	1.09	1.04	0.90	1.19
3	Retinal screening carried out	0.228	0.82	0.61	1.10	1.08	0.91	1.27	1.04	0.85	1.28
9	Pulses checked	0.045	0.89	0.68	1.16	1.15	0.98	1.34	1.22	**1.00**	**1.47**
10	Neuropathy test carried out	0.454	0.87	0.66	1.15	1.13	0.96	1.32	1.15	0.95	1.41
11	Blood pressure recorded	0.042	0.43	0.18	1.01	1.05	0.68	1.62	0.84	0.48	1.48
12	Blood pressure < 130/85 mmHg	0.885	1.00	0.81	1.23	1.11	0.98	1.25	1.09	0.94	1.26
13	Microalbuminuria testing carried out	**0.000**	0.72	**0.56**	**0.92**	1.10	0.95	1.26	1.07	0.89	1.27
14	Creatinine recorded	0.371	0.74	0.45	1.24	0.97	0.73	1.30	1.06	0.73	1.54
15	On ACE and prot or micro	0.196	1.15	0.38	3.44	1.53	0.83	2.80	1.00	0.50	2.00
16	Cholesterol recorded	0.184	0.82	0.51	1.31	1.10	0.84	1.44	1.11	0.78	1.56
17	Cholesterol < 5 mmol/l	0.104	0.82	0.66	1.03	1.61	**1.42**	**1.83**	0.94	0.81	1.09
18	Flu vaccination carried out	0.719	1.00	0.74	1.34	0.98	0.82	1.16	1.06	0.86	1.32

ACE, acetylcholinesterase; CI, confidence interval; HbA_{1c}, glycated haemoglobin; prot, proteinuria; micro, microalbuminuria.
Numbers in bold are significant of $P < 0.01$.

One limitation of the study is that only patients with diagnosed diabetes were included: the study did not take account of the estimated 600 000 people in the UK with undiagnosed diabetes [30]. The probability of diagnosis may not be equal in patients with and without a mental illness. For instance, the increasing awareness of the association between schizophrenia and risk of diabetes may be causing increased screening and hence diagnosis of such patients. Alternatively, patients with a mental illness may be less likely to be screened as a result of difficulties in accessing medical services. Two further limitations of the study are: that it does not include the small but significant proportion of people with severe mental illness who are not registered with a GP; and that it relies on data that were collected largely because of financial incentives, which might have led to bias in those entering the data. Some general practices have reported making minor variations in the way they used certain codes (such as the E11 sub-codes), which will have led to small variations in which patients are counted as having disorders such as bipolar disorder.

Lastly, while the use of the government-endorsed nGMS quality indicators as outcome measures was pragmatic, as the financial incentive to complete the information led to good data quality, the indicators themselves have been criticized as weak measures of health-care quality [31] that fail to take into account issues such as patient satisfaction and continuity of care. It should be noted, however, that the use of individual patient data in this study avoided the most widely criticized aspect of the quality indicators, exception reporting (in which patients' data are excluded by the GP from quality indicator calculations).

The finding that patients with schizophrenia or bipolar disorder were significantly more likely to have an $HbA_{1c} < 7.5\%$ replicates the finding of Dixon *et al*. in the USA [21]. The US authors suggested that this difference could be because of the role mental health services play in encouraging better adherence to diabetes treatment. Alternatively, the lower levels could be as a result of superior monitoring and care, but this is not reflected in other measures. A third possibility is that, although rates of diabetes amongst people with severe mental illness are high, their diabetes is less severe. This finding requires further exploration.

The one consistent confounding variable was age; why do older people have better diabetic care? GPs may see older patients more frequently because of other morbidities, or psychological factors such as loneliness; GPs may take symptoms indicative of diabetes more seriously in older patients; older patients might be more likely to report symptoms or request health checks; and older patients with severe mental illnesses have by definition survived longer without dying through suicide or other complications. Older patients are also largely likely to have Type 2 diabetes.

The diabetes care received overall by the subjects of our study is good when judged by the nGMS performance indicators, but there is still room for improvement, particularly on HbA_{1c} and on screening for retinopathy, vasculopathy and neuropathy. Moreover, the nGMS indicators themselves are arguably insufficiently stringent. For example, some—including the

National Institute for Health and Clinical Excellence [32]—would prefer an HbA_{1c} target ≤ 6.5%, as achieving this would cut rates of diabetic complications much further.

Statement of consent

The conduct of the study was in accordance with the principles of the Declaration of Helsinki. Data were extracted anonymously from routinely collected clinical databases, as permitted by section 60 of the Health and Social Care Act 2001 and by the guidelines of the General Medical Council. The study was approved by the Trent Multi-Centre Research Ethics Committee (MREC) and the QRESEARCH scientific advisory board.

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Competing interests

JHC and AM are associated with the QRESEARCH project. JHC is an unpaid director of QRESEARCH, which is a not-for-profit organization, 50% owned by the University of Nottingham and 50% owned by EMIS, a commercial supplier of computer systems to 60% of UK primary care. SW, CP and MP have no competing interests to declare.

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