Differences in the quality of primary medical care services by remoteness from urban settlements

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Objective: To examine if the quality of primary medical care varies with remoteness from urban settlements.

Design: Cross-sectional analysis of publicly available data of 18 process and intermediate outcome measures for people with coronary heart disease (CHD), diabetes and stroke.

Setting and participants: Populations registered with 912 general practices in Scotland grouped into three categories by level of remoteness from urban settlements: not remote, remote and very remote.

Main outcome measures: Mean percentages achieving quality indicators and interquartile range scores.

Results: Remote and very remote practices were more likely to have characteristics associated with low Quality and Outcomes Framework (QOF) total points score (smaller, higher capitation income, dispensing practice, and had lower statin prescribing despite higher prevalence of cardiovascular disease and diabetes). However, in contrast with previous research, there was little evidence that quality of care was lower in more remote areas for the 18 process and intermediate outcome measures examined. The exception was significantly lower cholesterol measurement and control in people with CHD, diabetes and stroke attending very remote practices ($p < 0.01$) and β -blocker prescription in CHD ($p = 0.01$).

Conclusions: Under QOF, there are few differences in the quality of care delivered to patients in practices with different degrees of remoteness. The differences in achievement for cholesterol were consistent with lower rates of statin prescribing relative to disease burden in very remote practices. No differences were found for complex process measures such as retinopathy screening, implying that differences under QOF are more likely to be due to slower adoption of evidence-based practice than access problems. Examining this will require analysis of individual patient data.

The influence of remoteness on the delivery and quality of primary care is given particular prominence in Scottish health policy, reflected in the weighting for the higher costs of service delivery in the weighted capitation formula for general practice (the global sum), which is the single largest determinant of practice income.^{1,2} However, recent changes to the provision of healthcare through the 2004 General Medical Services (GMS) contract and working time directives have impacted on the viability of maintaining and recruiting medical staff in remote and rural areas.³ Concerns have been raised on how such changes may impact on quality of care in rural areas.⁴ Remote residents have a relatively high need for healthcare, which may be compounded by changes in service provision through closure of rural hospitals and general practices.⁵ Remote areas have historically had fewer female general practitioners (GPs), leading to reduced choice for patients and poorer access to some treatments.⁶ The trade-off between economies of scale and geographical access presents a major challenge to healthcare delivery in remote areas and leads to the possibility that some services may not be provided due to cost.⁷ Distance from health services has been shown to inhibit use of primary care, as patients face higher costs to get to practices and may be less likely to attend for routine treatment, and access to specialist investigation and advice may be more limited.^{7–9} Practitioners in more remote areas may also have less access to education.¹⁰

The Quality and Outcomes Framework (QOF) of the 2004 GMS contract links up to 25% of UK GPs' pay to performance measured against 146 clinical and organisational quality indicators. The QOF offers a data source that allows for comparisons of performance on a range of indicators between urban and remote areas. Many factors may impact on the performance of remote areas in the QOF. On average, practices

in more remote areas receive more money under the global sum, have older GPs,¹¹ fewer staff and smaller practice teams,¹¹ all of which have been shown to have a negative impact on achievement in the QOF.¹²

Achievement on each indicator in QOF is transformed into a point's score, with the points for each indicator representing the relative importance of the indicator, and a maximum of 1050 points available. Research undertaken on QOF data so far has for the most part concentrated on points' achievement.^{12–14} However, practices can achieve full points without achieving 100% coverage of their patients. Moreover, practices are allowed to exception report patients who are unsuitable, excluding them from measurement either from entire clinical areas or from particular indicators. Reasons to exception report are likely to vary depending on location and demography. Measuring quality using percentages of non-excluded patients has been shown to conceal continuing socioeconomic inequalities in service provision¹⁵ and the same may be true of remoteness.

The aim of the present study was therefore to examine how the quality of primary care varies by remoteness, measuring quality using the percentage of all patients with the disease who achieve a particular target irrespective of whether they have been exception reported ("delivered" quality, in contrast with "payment" quality, in which exceptions are allowed).

METHODS

Remoteness was measured using the Scottish Executive Urban-Rural Classification.¹⁶ This eight-category measure is available

Abbreviations: CHD, coronary heart disease; GMS, General Medical Services; GP, general practitioner; QOF, Quality and Outcomes Framework

Table 1 Differences in practice structure and population need by remoteness

Variable	Not remote practices (n = 787)	Remote practices (n = 54)	Difference from not remote p > t	Very remote practices (n = 71)	Difference from not remote p > t
Average list size	7536	5296	<0.001	4204	<0.001
No. of whole-time equivalent GPs	4.6	4.0	<0.001	3.7	<0.001
Average age of GPs (years)	44.0	44.7	<0.001	45.8	<0.001
Female GPs (%)	44	37	<0.001	36	<0.001
Patients over 65 (%)	15.1	19.4	<0.001	18.4	<0.001
Scottish Index of Multiple Deprivation (SIMD)					
Income	15.7	12.0	<0.001	11.4	<0.001
Access	-0.9	0.6	<0.001	0.8	<0.001
Health	0.0	-0.3	<0.001	-1.0	<0.001
Practices with dispensing status (%)	3	15	<0.001	33	<0.001
Global sum per patient (£)	51.4	65.9	<0.001	86.2	<0.001
Prevalence rates (%)					
Diabetes	3.3	3.5	<0.001	3.4	<0.001
Coronary heart disease	4.8	5.5	<0.001	5.1	<0.001
Stroke	1.9	2.3	<0.001	2.2	<0.001
Hypertension	12.0	13.9	<0.001	14.8	<0.001
Statin daily defined doses per capita	46.7	47.8	<0.001	41.4	<0.001

for 42 000 output areas with average populations of 117 residents and stratifies the population by the size of settlement and drive times from large urban settlements (see supplementary material available at <http://qshc.bmj.com/supplemental>). We examined the locations of residence of practice populations and assigned practices to the category containing the largest proportion of their registered population as at September 2004. On the basis of our preliminary analysis we categorised practices into three groups defined by remoteness:

- not remote practices—primary cities, urban settlements, accessible small towns and accessible rural areas;
- remote practices—remote small towns and remote rural areas;
- very remote practices—very remote small towns and very remote rural areas.

Using routine data for 2004/5 from the Information and Statistic Division of NHS Scotland (ISDScotland), we characterised practices in terms of list size, whole-time equivalent numbers of principals and non-principals (a variable reflecting the size of the practice team), GP sex, dispensing status, and

global sum payment (a weighted capitation payment for essential and additional services provided by the practice and reflecting practice population age and sex structure, and associated clinical need and service cost), disease prevalence and statin prescribing.

We use data returned via the Quality Management and Analysis System to ISDScotland for all general practices in Scotland. The analysis is restricted to 912 GMS practices, and focuses on care for people with established cardiovascular disease or diabetes. The indicators examined are either intermediate outcomes tightly linked to long-term outcomes¹⁷ or process and treatment indicators strongly recommended in national guidelines. The 18 indicators selected account for 168 (16%) of the total points, reflecting their high importance in the QOF points weighting. We present mean percentages for “delivered” quality (based on the care delivered to all patients) and interquartile scores for indicators in five of the 10 clinical domains where the denominator is for all patients with the disease. This method has been explained in more detail elsewhere.¹⁵ Regression analysis was used to analyse differences between the categories. We compare each mean value to the reference category of not remote practices. Significance testing

Table 2 Percentage of patients with specified process of care delivered

Process*	Not remote practices (n = 787) Mean (IQR)	Remote practices (n = 54) Mean (IQR)	Difference from not remote p > t	Very remote practices (n = 71) Mean (IQR)	Difference from not remote p > t
Simple processes					
CHD—blood pressure recorded	95.1 (4.4)	94.0 (5.8)	0.50	93.8 (6.8)	0.35
Stroke—blood pressure recorded	93.9 (6.4)	93.4 (6.8)	0.98	92.3 (10.0)	0.25
Diabetes—blood pressure recorded	97.4 (2.7)	97.0 (3.6)	0.53	97.7 (3.3)	0.44
CHD—cholesterol recorded	87.2 (10.3)	85.3 (12.8)	0.46	80.1 (23.0)	<0.01
Stroke—cholesterol recorded	81.6 (15.7)	81.7 (16.9)	0.99	73.0 (32.9)	<0.01
Diabetes—cholesterol recorded	93.0 (5.7)	93.4 (5.0)	0.64	92.8 (9.2)	0.65
Complex processes					
Diabetes—retinal screening recorded	77.9 (17.9)	81.9 (13.1)	0.03	80.2 (19.9)	0.21
Diabetes—peripheral pulses recorded	80.2 (16.0)	82.7 (14.4)	0.19	79.0 (20.6)	0.55
Diabetes—neuropathy testing recorded	78.2 (17.4)	81.2 (14.2)	0.19	77.6 (22.2)	0.77
COPD—diagnosis by spirometry	65.1 (35.3)	59.1 (51.6)	0.61	60.0 (58.7)	0.41
COPD—record of recent FEV ₁	58.0 (39.3)	57.6 (49.7)	0.91	59.0 (56.7)	0.78

CHD, coronary heart disease; IQR, interquartile range.

*All processes recorded in previous 15 months, except chronic obstructive pulmonary disease (COPD) record of recent forced expiratory volume in 1 s (FEV₁), where recorded in previous 27 months.

Table 3 Percentage of patients achieving specified intermediate outcome

Outcome indicators	Not remote practices (n = 787) Mean (IQR)	Remote practices (n = 54) Mean (IQR)	Difference from not remote p > t	Very remote practices (n = 71) Mean (IQR)	Difference from not remote p > t
CHD—blood pressure $\leq$ 150/90 mm Hg	83.4 (10.3)	80.9 (11.9)	0.11	82.1 (12.7)	0.09
Stroke—blood pressure $\leq$ 150/90 mm Hg	80.1 (12.5)	78.0 (14.2)	0.24	77.8 (23.3)	0.21
Diabetes—blood pressure $\leq$ 145/85 mm Hg	70.6 (14.8)	69.1 (14.2)	0.41	68.1 (20.0)	0.15
CHD—cholesterol $\leq$ 5 mmol/l	65.3 (15.7)	61.2 (17.1)	0.12	53.8 (28.5)	<0.01
Stroke—cholesterol $\leq$ 5 mmol/l	57.7 (18.1)	54.1 (23.3)	0.12	46.6 (29.9)	<0.01
Diabetes—cholesterol $\leq$ 5 mmol/l	68.0 (12.2)	67.9 (14.4)	0.93	62.1 (17.6)	<0.01
HbA1c $\leq$ 7.4%—diabetes	49.7 (10.9)	50.8 (12.3)	0.51	50.2 (12.9)	0.71
HbA1c $\leq$ 10%—diabetes	85.4 (6.9)	87.2 (7.5)	0.12	87.0 (8.7)	0.19

CHD, coronary heart disease.

is based on practice-level data using a threshold of $p < 0.01$ as our measurement of significance. The analysis was undertaken in STATA (version 8.2), using robust standard errors.

RESULTS

Table 1 shows mean values for a range of practice characteristics. Very remote practices had the smallest lists, the fewest whole-time equivalent GPs, the highest average age for GPs, and the lowest proportion of female GPs. They had the highest proportion of dispensing practices, and received higher capita-tion under the global sum. Very remote practices were less income and health deprived, but had a higher access deprivation score. Lower defined daily doses of statins per capita were prescribed in very remote practices even though they have significantly higher raw prevalence rates ($p < 0.001$) for diabetes, coronary heart disease (CHD), stroke, and hypertension than not remote practices (although the highest prevalences for diabetes, CHD and stroke are found in remote practices).

Table 2 shows the mean values for 11 process indicators. The trend for performance was for higher scores in not remote practices and lower scores for very remote practices. Remote and remote practices did not differ significantly with regard to delivered quality, but very remote practices had significantly lower quality for cholesterol recording in CHD and stroke ($p < 0.01$; absolute differences 7.1% and 8.6%). The interquartile range was higher in very remote areas for all process indicators with the exception of blood pressure recording in people with diabetes.

Table 3 shows the mean values for delivered quality for outcome indicators. Not remote and remote practices did not differ significantly. Of the nine process indicators delivered quality was significantly lower in very remote practices for all three of the cholesterol-controlled indicators (absolute differences for CHD 11.5%; for stroke 11.1%; and for diabetes 5.9%). The interquartile range was higher in very remote areas for all outcome indicators.

Table 4 shows the mean values for treatment indicators. Influenza immunisation was lowest in not remote practices although the differences were not significant. β -Blocker prescription for people with CHD was of significantly lower quality in very remote practices compared with not remote ones ($p = 0.01$). The interquartile range was higher in very remote areas for all treatment indicators.

DISCUSSION

This is the first study to have examined variations in quality by remoteness using 2004 GMS contract data, and to measure quality in terms of the actual care delivered. Its major limitation reflects the way in which data are held in the payment system. "Delivered quality", or the actual proportions of patients who achieve quality targets ignoring exclusions, can only be estimated for a limited number of indicators because the Quality Management and Analysis System in 2004/5 did not record either the true denominators for every indicator, or the register size on the same date that indicator data were extracted. However, the 18 indicators examined are among those with the greatest evidence of long-term benefit, reflected in their high points weighting.

Variables such as smaller clinical teams, higher average GP age and higher levels of income received from the global sum that have previously been shown to have a negative impact on performance in the QOF measured in terms of total points scores,¹² were significantly associated with very remote areas. However, for most of the indicators examined here, quality in terms of the percentage of patients receiving care or achieving intermediate outcome targets did not differ by remoteness. The lack of differences in complex process indicators such as foot and eye screening in diabetes, and for treatments that have to be delivered in a specific timeframe such as influenza immunisation is surprising, given that greater problems of accessibility in more remote areas would be expected to be most apparent for such measures.⁶⁻⁹ Overall, the data are therefore consistent with QOF ensuring better access to services than has

Table 4 Percentage of patients receiving specified treatment

Treatment indicators	Not remote practices (n = 787) Mean (IQR)	Remote practices (n = 54) Mean (IQR)	Difference from not remote p > t	Very remote practices (n = 71) Mean (IQR)	Difference from not remote p > t
CHD—on aspirin or equivalent	88.0 (7.7)	86.1 (7.4)	0.05	86.3 (11.9)	0.06
CHD—on β -blocker	53.4 (8.7)	51.8 (8.1)	0.26	50.7 (13.6)	0.01
Had influenza immunisation—CHD	75.8 (9.9)	76.9 (8.9)	0.29	75.2 (16.0)	0.94
Had influenza immunisation—stroke	71.6 (12.6)	74.7 (16.5)	0.19	72.6 (20.6)	0.65
Had influenza immunisation—diabetes	73.2 (11.3)	75.5 (13.7)	0.34	75.6 (15.3)	0.27
Had influenza immunisation—COPD	76.7 (12.4)	78.8 (16.3)	0.41	77.5 (17.9)	0.74

CHD, coronary heart disease; COPD, chronic obstructive pulmonary disease.

been found in previous research, although there is greater heterogeneity of performance in more remote areas.^{6,7} This is not to deny the particular access problems of more remote practices, but rather to recognise that with large financial incentives motivating service delivery, high quality is achievable even where there are considerable access barriers.

In contrast, differences were seen in simple process indicators for cholesterol measurement and control that can be done opportunistically, or intermediate outcome indicators that largely depend on prescription which might be expected to be less dependent on accessibility. The lower rates of statin prescribing relative to disease burden in very remote practices is consistent with the 6–11% differences in patients achieving a cholesterol of ≤ 5 mmol/l, and is clinically important given the impact of statin prescribing and cholesterol control on longer-term outcomes. One possible explanation is that under QOF, differences in quality are more related to slower diffusion of evidence-based practice in more remote, and therefore professionally isolated areas, where practitioners have less access to continuing professional development. Examining this issue further will require individual patient data, which would allow for casemix adjustment and direct examination of prescribing patterns in a way that is not possible with practice-aggregate QMAS data.

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