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## EPIDEMIOLOGY

# Inequalities in the primary care of patients with coronary heart disease and serious mental health problems: a cross-sectional study

Julia Hippisley-Cox, Chris Parker, Carol Coupland, Yana Vinogradova

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**Objective:** To determine whether UK patients with coronary heart disease (CHD) who also have schizophrenia or bipolar disorder are less likely to receive primary care in accordance with the agreed national standards of the UK than patients without these mental health problems.

**Design:** Cross-sectional study.

**Setting:** 485 UK general practices contributing anonymised medical records of over 3.26 million patients to the QRESEARCH database.

**Participants:** 127 932 patients with CHD of whom 701 had a diagnosis of schizophrenia or bipolar disorder.

**Main outcome measures:** The relative risks of receiving statin medication and each of the CHD care indicators defined in the UK General Medical Services contract, for patients with schizophrenia or bipolar disorder compared with patients with neither condition. The results were adjusted for age, sex, deprivation, diabetes, stroke and smoking status, and allowed for clustering by practice.

**Results:** Patients with schizophrenia were 15% less likely to have a recent prescription for a statin (95% CI 8% to 20%) and 7% less likely to have a recent record of cholesterol level (95% CI 3% to 11%). There were no significant differences in the adjusted analyses between mental health groups on recording smoking status, advising on smoking cessation, recording blood pressure, achieving target blood pressure or cholesterol values, or prescribing aspirin, antiplatelets, anticoagulants or  $\beta$  blockers.

**Conclusions:** Although the majority of CHD care indicators are achieved equally for patients who also have a serious mental health problem, there is a shortfall in identifying and treating raised cholesterol among patients with schizophrenia, despite their higher level of risk factors.

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Coronary heart disease (CHD) accounts for more deaths worldwide than all causes of cancer combined,<sup>1</sup> and it is the main medical factor associated with disability in Europe.<sup>2</sup> Statins have a proven role in reducing further cardiovascular events and improving survival among people with existing CHD.<sup>3–5</sup> The new General Medical Services (GMS) contract for UK primary care physicians has set national standards for quality care for CHD based on a number of indicators including cholesterol and blood pressure monitoring, advice and referral on smoking, and prescribing appropriate medications.<sup>6</sup>

CHD and coronary risk factors such as smoking, obesity and diabetes are more common among people with schizophrenia and bipolar disorder than in the remaining population,<sup>7</sup> and contribute to their shorter life expectancy.<sup>8–10</sup> Although the overall consultation rates with primary care physicians in the UK are three to four times higher in patients with serious mental health problems,<sup>11</sup> there is some evidence that they are less likely to be offered health-promotion interventions such as blood pressure checks or prescriptions for leisure.<sup>12–13</sup> It is not clear from previous research whether patients with serious mental health problems experience inequalities in care for CHD, and differences between healthcare systems may contribute to the variation in findings. Two US studies found deficits in care for patients with schizophrenia after acute myocardial infarction, contributing to an excess in mortality,<sup>14–15</sup> but other studies carried out within the US Veterans Health Administration (VA) system found no such shortfall.<sup>16–17</sup>

We undertook a study within a very large representative population in UK primary care to determine whether patients

with CHD who also have schizophrenia or bipolar disorder were less likely than patients without these mental health problems to receive good quality care in accordance with the agreed national standards of the UK.

## METHODS

### Data

The source of data was the QRESEARCH database which contains the anonymised electronic healthcare records of over 9 million patients ever registered with 499 general practices throughout England, Wales, Scotland and Northern Ireland. QRESEARCH is an aggregated patient-level database derived from a representative sample of 6% of all UK general practices. Consent to provide data is sought from practices using the EMIS medical records system (Egton Medical Information Systems Limited, Leeds, UK), and detailed analyses have shown these practices to be somewhat larger than non-participating practices but in all other respects very similar.<sup>18</sup> The information recorded on the database includes patient demographics (year of birth, sex, socioeconomic data derived from the UK 2001 census), characteristics (height, weight and smoking status), symptoms, clinical diagnoses, consultations, referrals, prescribed medication and the results of investigations. QRESEARCH V.8.0 database was used for this analysis. The database has been validated by comparing birth rates, death rates, consultation rates, prevalence and mortality rates with other data sources including the General Household Survey and

**Abbreviations:** CHD, coronary heart disease; GMS, General Medical Services; VA, Veterans Health Administration

the General Practice Research Database.<sup>19</sup> The age–sex structure of the population has been compared with that reported in the 2001 census. There was good correspondence for all these measures, although our population is slightly older and our prevalence figures are marginally higher than less recent data.<sup>20</sup> We have also compared practices taking part in regional research networks on these and other measures, and have found a good correspondence.<sup>21</sup> The prevalence of schizophrenia by age and sex matches closely with the figures published by the Office for National Statistics,<sup>19</sup> and the sex-specific prevalence of bipolar disorder is close to that recently reported for UK general practices.<sup>22</sup>

For this study, we included general practices if they had been using their current EMIS computer system before 1 April 2003 and had the data uploaded after 1 April 2005. These criteria were chosen to ensure that the data were as complete as possible for the study period. Patients were included if they were registered with an eligible practice by 1 April 2005, had been registered with this practice for the previous 12 months and were not registered as a temporary resident. Patients were included in the analysis if they had a computer-recorded diagnosis of CHD before 1 April 2005 and were aged  $\geq 25$  years.

The following information was extracted for each patient:

- personal and area demographics: age, sex and area Townsend deprivation score (grouped by quintile, with quintile 5 being the most deprived);
- serious mental health problems: a recorded diagnosis of schizophrenia or bipolar disorder before 1 April 2005 (see appendix A for code list);
- comorbid physical conditions: diagnosis of stroke or diabetes before 1 April 2005, and current smoking status;
- CHD management: any prescription of statins before 1 April 2005; the CHD indicators from the GMS contract (which was implemented in UK general practice on 1 April 2004, 12 months before the analysis date for this study).<sup>6</sup> These indicators were calculated according to the rule set for the quality and outcomes framework, and comprise CHD2, patients with newly diagnosed angina referred for exercise testing and/or specialist assessment; CHD3, smoking status recorded in the previous 15 months, or at least once if never smoked; CHD4, smoking cessation advice in the previous 15 months; CHD5, blood pressure recorded in the previous 15 months; CHD6, last blood pressure value  $\leq 150/90$  mm Hg; CHD 7, cholesterol blood test recorded in the previous 15 months; CHD 8, last cholesterol value  $\leq 5$  mmol/l; CHD9, treatment with aspirin, antiplatelet or anticoagulant in the previous 15 months; and CHD10, current treatment with  $\beta$  blocker. For each indicator, there is a variable showing eligibility (eg, only current smokers are eligible for smoking cessation advice), and a variable showing achievement.

## Analysis

We compared the outcomes between three groups of patients: those with schizophrenia, those with bipolar disorder and those with neither mental health condition. Patients with diagnoses of both schizophrenia and bipolar disorder were included in the schizophrenia group, and we carried out a sensitivity analysis to determine whether this classification had a significant effect on the results. In view of the relatively high proportion of patients achieving these indicators, we compared the groups using relative risks (RRs) rather than odds ratios, and estimated these using Poisson regression with robust error variance.<sup>23</sup> RRs were calculated first unadjusted

and then adjusted for age group, sex, deprivation (quintiles), comorbid stroke and diabetes, and allowing for clustering by practice. Adjustment was also made for smoking except in the models for CHD3 and CHD4, where only current smokers are eligible. We selected a *p* value of  $<0.01$  (two tailed) as statistically significant.

We estimated the numbers of patients in the UK with CHD and the numbers with CHD who also have either schizophrenia or bipolar disorder by determining the prevalence in each 5 year age–sex band in our data and standardising it to the UK population (2001 census). These values were used to estimate the numbers of patients with CHD in the UK, with and without serious mental health problems, who are currently not treated with statins. CIs for these estimates were derived by bootstrapping, to take account of the clustered nature of the dataset and avoid underestimating SEs.<sup>24</sup> All the analyses were conducted using STATA V.9.2.

## RESULTS

In all, 485 UK general practices met the inclusion criteria, with 3 262 979 patients registered as on 1 April 2005. Table 1 describes the patients by sex, age and deprivation level, and shows that 0.24% of patients had a recorded diagnosis of schizophrenia and 0.16% a diagnosis of bipolar disorder. Overall, 3.2% of females and 4.6% of males had a diagnosis of CHD. The prevalence of this condition in the schizophrenia group was, 4.6% females, 4.0% males; and in the bipolar group, 7.4% females, 8.8% males (not tabulated). Standardising to the UK population gives an estimated 2 020 070 patients with CHD, of whom 5360 also have schizophrenia and 6578 also have bipolar disorder. Table 1 also shows the socioeconomic profile of each group: there was a slight over-representation of the least-deprived quintile on the overall database, and also among patients with CHD. The schizophrenia group was strongly skewed towards the most-deprived quintile, and there was a similar but less-marked effect in the bipolar group.

There were 127 932 patients aged  $\geq 25$  years with a recorded diagnosis of CHD, and these formed the sample for the study: their characteristics are shown in table 2. A total of 332 had a recorded diagnosis of schizophrenia, 408 had a diagnosis of bipolar disorder, and 39 had both these diagnoses, giving 701 patients with either schizophrenia or bipolar disorder. Patients with schizophrenia were younger, more likely to be female and more likely to live in a deprived area than those with neither mental health condition. Patients with bipolar disorder were of similar age as those with neither condition but were more likely to be female and living in a deprived area. The prevalence of diabetes and smoking were highest among patients with schizophrenia and the prevalence of stroke was highest among patients with bipolar disorder.

Table 3 shows the number of patients in each mental health group who were eligible for each indicator, and the number of eligible patients who achieved each outcome. Almost 75% of patients, overall, had been prescribed a statin in the previous 12 months, but this was only 65% for patients with schizophrenia. There was little difference between groups in the proportion who had taken statins in the past but were no longer doing so (around 6–7%). The largest differential between groups on eligibility for the indicators was for CHD4, smoking cessation advice, reflecting the higher proportion of smokers in the schizophrenia group. Many of the indicators had over 90% achievement among eligible patients, with little difference between mental health groups.

Table 4 shows the RR of each outcome for eligible patients with schizophrenia or bipolar disorder, compared with patients having neither condition, first unadjusted and then adjusted for

**Table 1** Total patients on database and those with schizophrenia, bipolar disorder or coronary heart disease

	Patients on database n	Patients with CHD n (% of patients on database)	Patients with schizophrenia n (% of patients on database)	Patients with bipolar disorder n (% of patients on database)
Overall	3 262 979	127 993 (3.92)	7845 (0.24)	5137 (0.16)
Female				
<25 years	433 153	32 (0.01)	52 (0.01)	34 (0.01)
25–34 years	194 043	60 (0.03)	232 (0.12)	172 (0.09)
35–44 years	255 235	361 (0.14)	520 (0.20)	502 (0.20)
45–54 years	217 601	1972 (0.91)	692 (0.32)	639 (0.29)
55–64 years	206 330	6832 (3.31)	763 (0.37)	724 (0.35)
65–74 years	151 034	13 989 (9.26)	595 (0.39)	590 (0.39)
75–84 years	118 313	19 001 (16.06)	436 (0.37)	369 (0.31)
>85 years	55 579	10 103 (18.18)	139 (0.25)	118 (0.21)
All females	1 631 288	52 350 (3.21)	3429 (0.21)	3148 (0.19)
Male				
<25 years	458 507	29 (0.01)	166 (0.04)	39 (0.01)
25–34 years	205 924	99 (0.05)	684 (0.33)	190 (0.09)
35–44 years	271 866	1002 (0.37)	1045 (0.38)	344 (0.13)
45–54 years	229 504	5243 (2.28)	987 (0.43)	408 (0.18)
55–64 years	211 324	16 014 (7.58)	835 (0.40)	490 (0.23)
65–74 years	141 945	24 993 (17.61)	468 (0.33)	315 (0.22)
75–84 years	87 302	22 064 (25.27)	199 (0.23)	167 (0.19)
>85 years	25 319	6199 (24.48)	32 (0.13)	36 (0.14)
All males	1 631 691	75 643 (4.64)	4416 (0.27)	1989 (0.12)
	n (% of patients in column)	n (% of patients in column)	n (% of patients in column)	n (% of patients in column)
Deprivation score				
Quintile 1 (least deprived)	711 529 (21.8)	27 303 (21.3)	715 (9.1)	812 (15.8)
Quintile 2	636 549 (19.5)	25 335 (19.8)	830 (10.6)	797 (15.5)
Quintile 3	590 247 (18.1)	24 178 (18.9)	1147 (14.6)	927 (18.0)
Quintile 4	544 298 (16.7)	22 832 (17.8)	1739 (22.2)	1065 (20.7)
Quintile 5 (most deprived)	591 633 (18.1)	23 029 (18.0)	3142 (40.1)	1323 (25.8)
Missing Townsend score	188 723 (5.8)	5316 (4.2)	272 (3.5)	213 (4.1)

CHD, coronary heart disease.  
Values are n (%).

**Table 2** Characteristics of patients with coronary heart disease, with and without serious mental health problems

Characteristics	Schizophrenia* (n = 332)	Bipolar disorder* (n = 369)	Neither (n = 127 231)
Sex			
Female	157 (47.3)	213 (57.7)	51 948 (40.8)
Male	175 (52.7)	156 (42.3)	75 283 (59.2)
Ageband (years)			
<55	46 (13.9)	27 (7.3)	8664 (6.8)
55–64	90 (27.1)	73 (19.8)	22 683 (17.8)
65–74	102 (30.7)	113 (30.6)	38 767 (30.5)
≥75	94 (28.3)	156 (42.3)	57 117 (44.9)
Townsend deprivation score			
Quintile 1 (least deprived)	37 (11.1)	48 (13.0)	27 209 (21.4)
Quintile 2	36 (10.8)	54 (14.6)	25 239 (19.8)
Quintile 3	51 (15.4)	63 (17.1)	24 061 (18.9)
Quintile 4	84 (25.3)	87 (23.6)	22 653 (17.8)
Quintile 5 (most deprived)	114 (34.3)	95 (25.7)	22 806 (17.9)
Missing Townsend score	10 (3.0)	22 (6.0)	5263 (4.1)
Other factors			
Diabetes	75 (22.6)	70 (19.0)	23 481 (18.5)
Stroke	44 (13.3)	58 (15.7)	14 936 (11.7)
Current smoker	124 (37.4)	73 (19.8)	16 848 (13.2)

Values are n (%).

\*Schizophrenia group includes 39 patients with both schizophrenia and bipolar disorder; bipolar group includes patients with bipolar disorder only.

**Table 3** Eligibility and achievement of indicators and use of statins in patients with and without serious mental health problems

Outcome	Schizophrenia* (n = 332)	Bipolar disorder* (n = 369)	Neither (n = 127 231)
Ever prescribed statin, n (% of mental health group)	229 (69.0)	286 (77.5)	100 653 (79.1)
Prescribed statin in the past 12 months, n (% of mental health group)	216 (65.1)	264 (71.5)	94 562 (74.3)
Discontinued statins†, n (% of those ever prescribed statin)	13 (5.7)	22 (7.7)	6091 (6.1)
Eligible for indicators: n (% of mental health group)			
CHD2: exercise testing or referral for newly diagnosed angina	33 (9.9)	50 (13.6)	15 131 (11.9)
CHD3: smoking status recorded in previous 15 months	329 (99.1)	365 (98.9)	125 811 (98.9)
CHD4: smoking cessation advice in previous 15 months	124 (37.3)	73 (19.8)	16 848 (13.2)
CHD5: blood pressure recorded in previous 15 months	328 (98.8)	366 (99.2)	126 405 (99.4)
CHD6: latest blood pressure value $\leq$ 150/90 mm Hg in previous 15 months	319 (96.1)	355 (96.2)	123 220 (96.8)
CHD7: cholesterol recorded in previous 15 months	315 (94.9)	352 (95.4)	123 979 (97.4)
CHD8: latest cholesterol value $\leq$ 5 mmol/l in previous 15 months	284 (85.5)	322 (87.3)	114 535 (90.0)
CHD9: aspirin, antiplatelet or anticoagulant in previous 15 months	314 (94.6)	353 (95.7)	123 062 (96.7)
CHD10: current treatment with $\beta$ blocker	244 (73.5)	254 (68.8)	95 943 (75.4)
Achieving indicators: n (% of eligible patients)			
CHD2: exercise testing or referral for newly diagnosed angina	15 (45.5)	36 (72.0)	10 122 (66.9)
CHD3: smoking status recorded in previous 15 months	317 (96.4)	359 (98.4)	121 615 (96.7)
CHD4: smoking cessation advice in previous 15 months	117 (94.4)	72 (98.6)	15 919 (94.5)
CHD5: blood pressure recorded in previous 15 months	322 (98.2)	362 (98.9)	124 137 (98.2)
CHD6: latest blood pressure value $\leq$ 150/90 mm Hg in previous 15 months	274 (85.9)	305 (85.9)	105 959 (86.0)
CHD7: cholesterol recorded in previous 15 months	277 (87.9)	340 (96.6)	117 001 (94.4)
CHD8: latest cholesterol value $\leq$ 5 mmol/l in previous 15 months	199 (70.1)	227 (70.5)	83 841 (73.2)
CHD9: aspirin, antiplatelet or anticoagulant in previous 15 months	285 (90.8)	324 (91.8)	113 350 (92.1)
CHD10: current treatment with $\beta$ blocker	159 (65.2)	179 (70.5)	65 145 (67.9)

CHD, coronary heart disease.

\*Schizophrenia group includes 39 patients with both schizophrenia and bipolar disorder; bipolar group includes patients with bipolar disorder only.

†Patients prescribed statins in the past but not within the past 12 months.

age, sex, deprivation, diabetes, stroke and smoking, and allowing for clustering by practice. Adjustment made little difference to the estimated RRs, and only two of the measures showed a significant difference between groups. Eligible patients with schizophrenia were 15% less likely than those with neither condition to have had statins prescribed in the last 12 months (95% CI 8% to 20%). This shortfall persisted if the 39 patients with both schizophrenia and bipolar disorder were excluded (14% less likely, 95% CI 7% to 20%). Patients with schizophrenia were also 7% less likely to have had their cholesterol recorded in the past 15 months (CHD7, 95% CI 3% to 11%). There was a marginally significant shortfall in exercise testing or referral (CHD2) among patients with schizophrenia ( $p = 0.04$ ), but only 10% of the group were eligible for this indicator and the comparison was therefore based on small numbers.

As reported above, we estimated that there are just over 2 million patients with CHD in the UK, of whom 74.3% (95% CI 73.6% to 75.0%) are currently prescribed statins. This would indicate that over 500 000 patients with CHD in the UK are not receiving statin treatment. In the subgroup of approximately 5360 patients with CHD who also have schizophrenia, the lower rate of statin prescription at 65.1% (95% CI 60.4% to 69.7%) indicates that an estimated 1870 (95% CI 1620 to 2120) would be untreated.

## DISCUSSION

This study of the primary care of over 127 000 UK patients with CHD found that for the majority of nationally specified care indicators, there were no inequalities for patients who also had a serious mental health problem (schizophrenia or bipolar disorder). There were two areas of care where patients with

schizophrenia showed a significant deficit: the recording of cholesterol values and the prescription of statins. There were no significant differences in the recording of smoking status or provision of advice on smoking cessation, the recording of blood pressure, the achievement of target blood pressure or cholesterol values, or the prescription of aspirin, antiplatelets, anticoagulants or  $\beta$  blockers.

## Strengths and weaknesses

This study was based on the routine primary care records of a large and representative population-based sample. Recording of clinical diagnoses and prescribed medications has been shown to have good levels of accuracy and completeness in UK general practices,<sup>25</sup> with the quality of the electronic record now surpassing the conventional paper-based system.<sup>26</sup> The indicators of care included in this study were agreed as a national standard as part of the UK GMS contract for general practitioners, and the quality of recording would be expected to be high.

Our study was limited to patients who access primary care, which would have excluded any individuals, such as those in prisons or other institutions, who were not registered with a general practitioner. There is a marginal under-representation of the most-deprived socioeconomic group on the overall database. There was a similar deprivation gradient among the patients with CHD, when the opposite might have been expected: possible explanations for this include underdiagnosis of the condition in the most-deprived groups, or their shorter survival with the condition.

The group with schizophrenia had only a marginally higher prevalence of CHD than the general population, whereas in the bipolar group, it was substantially higher; however, the schizophrenia group was much younger. We based our study

**Table 4** RRs for use of statins and achievement of indicators in eligible patients with and without serious mental health problems

Outcome	Schizophrenia*		Bipolar disorder*	
	Unadjusted RR (95% CI)	Adjusted RR† (95% CI)	Unadjusted RR (95% CI)	Adjusted RR† (95% CI)
Prescribed statins ever	0.87 (0.81 to 0.94)	0.85 (0.80 to 0.91)	0.98 (0.93 to 1.04)	0.99 (0.94 to 1.04)
CHD2: exercise testing or referral for newly diagnosed angina	0.88 (0.81 to 0.95)	0.85 (0.80 to 0.92)	0.96 (0.90 to 1.03)	0.97 (0.90 to 1.05)
CHD3: smoking status recorded in previous 15 months	0.68 (0.47 to 0.99)	0.69 (0.48 to 0.98)	1.08 (0.91 to 1.28)	1.10 (0.94 to 1.29)
CHD4: smoking cessation advice in previous 15 months	1.00 (0.98 to 1.02)	1.00 (0.98 to 1.02)	1.02 (1.00 to 1.03)	1.02 (1.00 to 1.03)
CHD5: blood pressure recorded in previous 15 months	1.00 (0.96 to 1.04)	1.00 (0.96 to 1.04)	1.04 (1.02 to 1.07)	1.04 (1.01 to 1.07)
CHD6: latest blood pressure value $\leq$ 150/90 mm Hg in previous 15 months	1.00 (0.99 to 1.02)	1.00 (0.99 to 1.02)	1.01 (1.00 to 1.02)	1.01 (1.00 to 1.02)
CHD7: cholesterol recorded in previous 15 months	1.00 (0.96 to 1.04)	1.01 (0.96 to 1.05)	1.00 (0.96 to 1.04)	1.01 (0.96 to 1.06)
CHD8: latest cholesterol value $\leq$ 5 mmol/l in previous 15 months	0.93 (0.89 to 0.97)	0.94 (0.90 to 0.98)	1.02 (1.00 to 1.04)	1.03 (1.01 to 1.05)
CHD9: aspirin, antiplatelet or anticoagulant in previous 15 months	0.96 (0.89 to 1.03)	0.99 (0.92 to 1.06)	0.96 (0.90 to 1.03)	1.00 (0.92 to 1.08)
CHD9: current treatment with $\beta$ blocker	0.99 (0.95 to 1.02)	1.00 (0.97 to 1.04)	1.00 (0.97 to 1.03)	1.01 (0.98 to 1.04)
	0.96 (0.88 to 1.05)	0.97 (0.88 to 1.06)	1.04 (0.96 to 1.12)	1.05 (0.98 to 1.13)

CHD, coronary heart disease.

\*Schizophrenia group includes 39 patients with both schizophrenia and bipolar disorder; bipolar group includes patients with bipolar disorder only.

†Adjusted for age, sex, deprivation, diabetes and stroke, and allowing for clustering within practice, also adjusted for smoking except for indicators CHD3 and CHD4.

on prevalent cases of CHD, which will have excluded anyone who had died before the study date, and in view of the higher mortality of people with serious mental health problems, it is possible that the survivors are untypical of the whole population.

### Previous studies

Previous studies of care for CHD among people with mental health problems have focused on patients hospitalised for acute myocardial infarction.

One study found that patients with a comorbid mental disorder were substantially less likely to undergo coronary revascularisation procedures<sup>14</sup>; another found that differences in five indicators of post-acute care (reperfusion, aspirin,  $\beta$  blockers, ACE inhibitors and smoking cessation advice) accounted for much of the excess 1 year mortality among patients with mental health conditions.<sup>15</sup> However, two studies conducted on samples from the US VA system found no differences in the likelihood of revascularisation, receipt of medications or presence of a cholesterol-management plan.<sup>16 17</sup> The authors of these latter studies suggest that barriers to effective medical care for people with mental health problems may exist to a lesser extent in the US VA system because of its integrated nature and high volume of mental healthcare.

### Implications

Although we found no inequalities in care on most of the measures, it is a cause for concern that patients with CHD and schizophrenia are less likely to receive effective monitoring and treatment for raised cholesterol. People with schizophrenia seem to be at an inherently higher risk of some physical illnesses,<sup>27</sup> and may also have increased risks associated with poor diet, physical inactivity or smoking.<sup>12</sup> Antipsychotic medications are known to have cardiac effects,<sup>28</sup> and the newer atypical agents, particularly clozapine and olanzapine, are associated with significant weight gain and higher risk of diabetes.<sup>29 30</sup> These factors emphasise the need for careful monitoring and treatment of CHD in people with schizophrenia.

Based on the present analysis we cannot confirm whether patients with schizophrenia are less likely to be offered cholesterol checks or statin treatment, or less likely to accept them. The proportion of patients eligible for cholesterol testing was somewhat lower in the group with schizophrenia (94.9% compared with patients with neither condition, 97.4%), reflecting a higher rate of exception codes recorded by their general practitioner, which may be an indication of patient's choice. However, a previous study found that people with severe mental illness were as likely as other patients to respond to an invitation for cardiac risk assessment.<sup>31</sup> Despite the deficits in cholesterol monitoring and provision of statins, there was apparently no inequality between mental health groups in the proportion with recent cholesterol value in the target range (indicator CHD8). However, the proportion eligible for this indicator was lower among patients with schizophrenia (85.5% compared with patients with neither condition, 90.0%), raising the possibility that the differential use of exception codes removes patients with schizophrenia from consideration and masks any inequality that exists. It should also be noted that the indicator refers to total serum cholesterol, and would not necessarily capture any differences in the component measures: a recent study found that high-density lipoprotein levels, but not total cholesterol levels, differed significantly between patients with and without severe mental illness.<sup>32</sup>

Equitable access to healthcare is about patients receiving the level of care appropriate to their level of need, rather than

a "one size fits all" approach. Patients with higher levels of need and greater risk of adverse outcomes, such as patients with schizophrenia who have higher rates of smoking and obesity, are likely to need more energetic screening and management, and this may need to be done at a younger age to get the maximum health gain possible. Global incentives such as those contained in the UK GMS contract may do little to improve the situation for individuals who have failed to benefit from previous initiatives such as screening and health promotion. Further research is needed to determine why these inequalities exist and also to determine the best strategies to address them.

## CONCLUSION

While the majority of CHD care indicators are achieved equally for patients who also have a serious mental health problem, there is a shortfall in identifying and treating raised cholesterol levels among patients with schizophrenia, despite their higher level of risk factors.

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All authors contributed to the study design, analysis plan, and manuscript. In addition, JH-C initiated the study, obtained ethical approval, supervised the data extraction and is the study guarantor.

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## APPENDIX A

### READ CODES FOR MENTAL HEALTH DIAGNOSES

#### Schizophrenia

E10, E100, E100-1, E1000, E1001, E1002, E1003, E1004, E1005, E100z, E101, E1010, E1011, E1012, E1013, E1014, E1015, E101z, E102, E1020, E1021, E1022, E1023, E1024, E1025, E102z, E103, E1030, E1031, E1032, E1033, E1034, E1035, E103z, E104, E104-1, E105, E1050, E1051, E1052, E1053, E1054, E1055, E105z, E106, E106-1, E107, E107-1, E1070, E1071, E1072, E1073, E1074, E1075, E107z, E10y, E10y-1, E10y0, E10y1, E10yz, E10z

#### Bipolar disorder

146D, E11, E11-1, E11-3, E111, E1110, E1111, E1112, E1113, E1114, E1115, E1116, E111z, E114, E114-1, E1140, E1141, E1142, E1143, E1144, E1145, E1146, E114z,

E115, E115-1, E1150, E1151, E1152, E1153, E1154, E1155, E1156, E115z,  
 E116, E1160, E1161, E1162, E1163, E1164, E1165, E1166, E116z,  
 E117, E1170, E1171, E1172, E1173, E1174, E1175, E1176

E11y1, E11y3, E11yz, E11z  
 Eu250, Eu250-1, Eu250-2, Eu30, Eu30-1, Eu302-3, Eu30y, Eu30z,  
 Eu311, Eu312, Eu31y-2

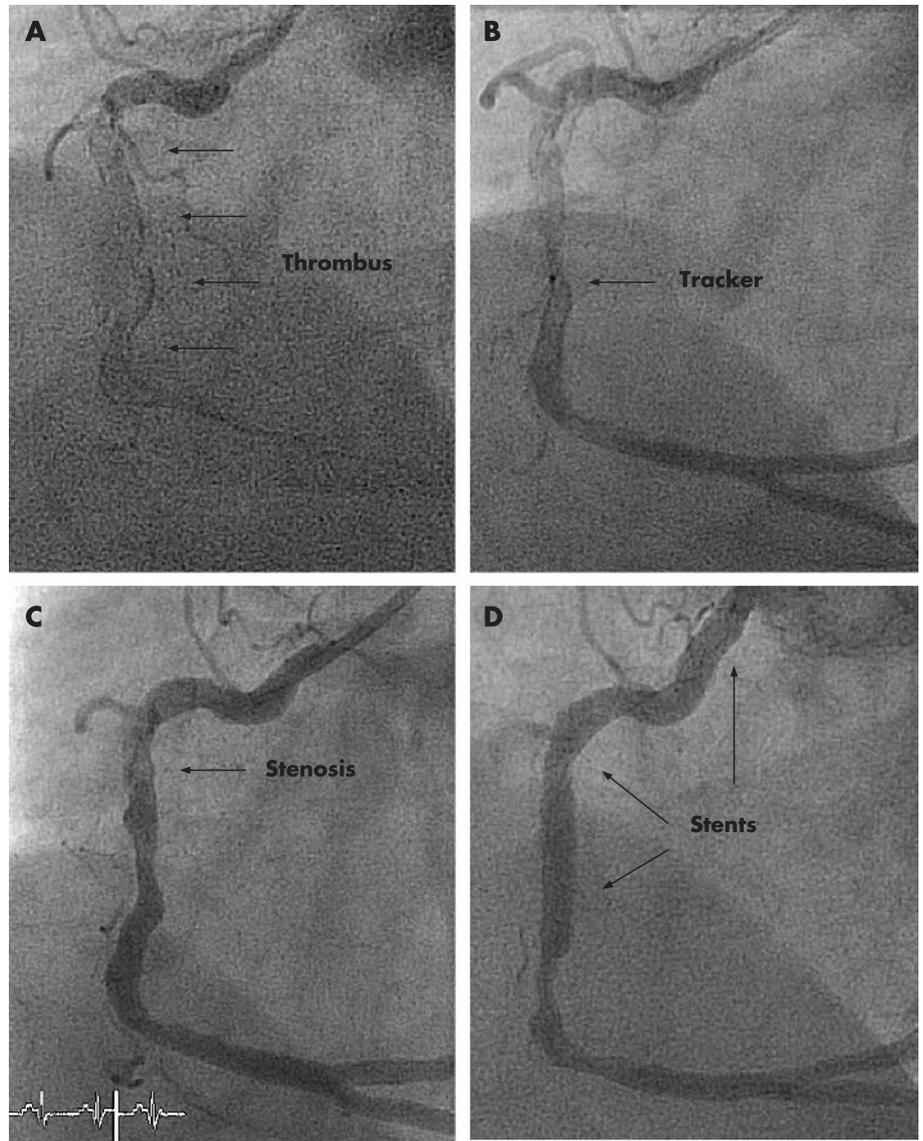
## IMAGES IN CARDIOLOGY .....

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### Intra-coronary alteplase for extensive coronary artery thrombus

**A** 60-year-old man presented with a non-ST-elevation acute coronary syndrome. He had had a myocardial infarction 4 years before. Despite appropriate medical treatment, his chest pain continued and the electrocardiogram showed dynamic changes. He was transferred as an emergency from the district general hospital to the tertiary centre catheter laboratory.

Coronary angiography showed a normal left anterior descending artery and a small, chronically occluded circumflex artery. The right coronary artery was of enormous calibre and completely occluded with thrombus (panel A). The amount of thrombus was considerable, the calibre of the artery large and the vessel tortuous; so pharmacological dissolution was selected in preference to thrombectomy. A coronary guidewire was passed down the tortuous vessel with support from a probing catheter (Tracker, Boston Scientific). The tip of the Tracker was positioned in the middle of the thrombus. Tissue plasminogen activator (alteplase, 1 mg/ml saline) was injected by hand through the Tracker (10 mg bolus, followed by an infusion of 50 mg over 20 minutes). The thrombus completely dissolved distal to the Tracker (panel B). The Tracker was therefore withdrawn to a proximal vessel, and a further 20 mg infused over 10 minutes. The remaining thrombus disappeared and the underlying ulcerated, atherosclerotic plaque was disclosed (panel C). After the implantation of three stents of 4.5 and 5 mm diameter, the final appearance of the vessel was excellent (panel D). The patient was discharged home uneventfully 3 days later.



To view video footage visit the *Heart* website—  
<http://heart.bmj.com/supplemental>

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