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Smoking cessation interventions for patients with coronary heart disease and comorbidities: an observational cross-sectional study in primary care

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How this fits in

Smoking cessation improves health outcomes for adults with coronary heart disease and primary care practitioners are well placed to support people to stop smoking. This study has shown that the quality of smoking cessation care provided in primary care was generally high for adults with CHD, but that more targeted support for particular groups (those from deprived areas and those with mental health problems) is required.

Abstract

Background: Smoking cessation is a core part of the primary care management of CHD but little is known about how smoking cessation practices differ for patients with different co-morbidities.

Aim: To determine the association between different patterns of co-morbidity and smoking rates and smoking cessation interventions in primary care for patients with CHD.

Design and Setting: Cross-sectional study of 81,456 adults with CHD in primary care in Scotland.

Method: Details of eight ‘concordant’ physical co-morbidities (i.e. conditions where smoking cessation is critical), 23 ‘discordant’ physical co-morbidities and eight mental health co-morbidities were extracted from electronic health records. Outcome measures were smoking status, smoking cessation advice recorded, and smoking cessation medication (nicotine replacement therapy, NRT) prescribed. Multilevel binary logistic regression models were constructed to determine the association between these patterns of co-morbidity and smoking status and the two smoking cessation interventions.

Results: The most deprived quintile had nearly three times higher odds of being current smokers than the least deprived (OR 2.76, 95% CI 2.49 to 3.05). People with CHD and two or more mental health co-morbidities had more than twice the odds of being current smokers than those with no mental health conditions (OR 2.11, 95% CI 1.99 to 2.24). Despite this, those with two or more mental health co-morbidities (OR 0.77, 95% CI 0.61 to 0.98) were less likely to receive smoking cessation advice, but absolute differences were small.

Conclusions: Patterns of co-morbidity are associated with variation in smoking status and the delivery of smoking cessation advice among people with CHD in primary care. Those from the most deprived areas and those with mental health problems are considerably more likely to be current smokers and require additional smoking cessation support.

INTRODUCTION

Coronary heart disease (CHD) is the leading cause of death worldwide.(1) It is now recognised that most people with CHD have additional co-morbidities, with important implications for how patients are treated and how services are organised.(2, 3) The type of co-morbidity is important too, as different conditions may be more or less challenging to manage alongside CHD. For example, ‘concordant’ physical conditions such as hypertension that share the same pathophysiological risk profile as CHD, are more likely to share the same treatment and self-management plan and are likely to present fewer problems in management than ‘discordant’ physical conditions that are not directly related in either their pathogenesis or management.(4) Similarly, patients with CHD and mental health co-morbidities may not receive optimal care of physical conditions if they are mostly seen by mental health teams.(5)

Tobacco smoking is one of the main risk factors for the development of CHD (6) and stopping smoking reduces the risk of mortality in individuals with established CHD.(7, 8) Smoking cessation practice in UK primary care involves three strands: (i) recording of smoking status; (ii) offering ‘brief interventions’(9) involving advice and encouragement to stop smoking; and (iii) offering nicotine replacement therapy (NRT) or other smoking cessation medication and/or referral to specialist smoking cessation services.

Since 2004, the Quality and Outcomes Framework (QOF) incentivised UK GPs to provide smoking cessation interventions with smokers who have certain chronic conditions, including CHD, which are regarded as a priority for smoking cessation. Yet there has been relatively little research into the quality of smoking cessation practice for patients with CHD in UK primary care.(10) This study uses individual level data to explore the relationship between three strands of smoking cessation practice (recorded smoking status, smoking cessation

advice and NRT prescribing) and three different patterns of co-morbidity in patients with CHD, taking account of age, sex, deprivation, and the effect of clustering by practice.

The following three research questions were posed:

1. Does *current smoking status* in people with CHD vary by patterns of co-morbidity?
2. Does *receipt of smoking cessation advice* in current smokers with CHD vary by patterns of co-morbidity?
3. Does *receipt of smoking cessation medication* in current smokers with CHD vary by patterns of co-morbidity?

METHODS

Study design and population

An observational cross-sectional study design was applied using population data from GP electronic medical records for one third of the Scottish population, which has previously been used to examine the prevalence of multimorbidity in the Scottish population and has been fully described in a previous paper.(2) The data used were extracted from a dataset held by the Primary Care Clinical Informatics Unit (PCCIU) at the University of Aberdeen. The dataset comprises complete copies of clinical data for all registered patients from 314 general practices caring for 1,754,133 registered patients, approximately one-third of the Scottish population. Data was collected between April 2006 and March 2007. The dataset has previously been shown to be representative of all Scottish patients in terms of age, sex and socio-economic status.(11)

Study variables

Smoking cessation practice

The three outcomes of interest in this study were: (i) recorded smoking status, (ii) recorded smoking cessation advice in the last 15 months, and (iii) recorded Nicotine Replacement Therapy (NRT) prescribing in the last 15 months. Recorded smoking status was based on 30 Read Codes (the standard coding system used in UK primary care) in the original dataset re-coded into 'Ex-Smoker/Never Smoked' or 'Current Smoker'. Previous research has found good validity of GP recording of smoking status, comparable to nationally representative population surveys.(12-15)

Recorded smoking cessation advice in the last 15 months (the timeframe used for QOF) was based on 21 different read codes re-coded into 'Advice recorded' or 'Advice not recorded' (defined as the absence of a smoking cessation advice code). This timeframe was also used for recorded NRT prescribing, which was defined as nicotine replacement therapy in British National Formulary section 4.10.2. All types of NRT – patches, gum, etc – were grouped together. Read Code lists are provided in Appendix 1.

Co-morbidities

Data on the presence of 40 conditions (i.e. CHD and 39 co-morbid conditions) was previously extracted by a team of researchers, including SM and BG, and has been described in detail elsewhere.(2) The present study explored the effect of three different patterns of co-morbidity on smoking cessation practice. These were: concordant physical co-morbidities, defined as physical conditions (vascular and respiratory) for which smoking is a significant risk factor and for which smoking cessation is considered critical; discordant physical co-morbidities (the remaining physical conditions where smoking cessation is less critical); and co-morbid mental health conditions. For all three patterns, we used a simple unweighted count of 0, 1, or ≥ 2 conditions. There were eight concordant physical conditions: five

broadly ‘vascular’ (hypertension, diabetes, chronic kidney disease (CKD), stroke/TIA, and peripheral vascular disease (PVD)) and three ‘respiratory’ (asthma, chronic obstructive pulmonary disease (COPD) and bronchiectasis). These conditions were considered to be concordant in relation to smoking cessation in that they are all exacerbated by smoking and smoking cessation is of utmost importance in their management. Most of these conditions are also included in the QOF and patients with these conditions are routinely invited to chronic disease management clinics in primary care, where smoking cessation interventions should be initiated.(16, 17) The eight mental health conditions and 23 discordant physical conditions can be found in Appendix 2, with their prevalences in this population.

Deprivation status

Socioeconomic deprivation was quantified using the Carstairs score, grouped into quintiles. This area-based measure of deprivation, derived from census and other routine data, has been widely used in health research.(18)

Statistical analysis

Descriptive analysis of the study population examined how smoking status, receipt of smoking cessation advice, and receipt of NRT varied by patient characteristics. For the three outcome variables of interest, multilevel binary logistic regression models were constructed in order to account for the clustering of patients within practices. Results are presented as univariate (crude) and multivariate (adjusted) odds ratios (ORs) and 95% confidence intervals (95% CI), with adjustment made for age group, sex, deprivation, and the three patterns of comorbidity. Analysis was carried out using STATA-MP version 14.0 (Texas, USA).

RESULTS

81,456 adults aged 25 and over with a recorded diagnosis of CHD were included in the first regression model, representing a prevalence of CHD in the population studied of 4.64% (95% CI 4.61 to 4.67). The distribution of study variables and outcomes and the characteristics of the study population are presented in Tables 1 and 2 respectively.

Smoking status

Smoking status was recorded in 99.6% of people with CHD, with 16,745 (20.5%) recorded as current smokers and 35,967 (44.1%) as ex-smokers. Table 3 shows the unadjusted and adjusted ORs of being a current smoker. There were marked differences in the odds of being a smoker by age group, deprivation quintile, and different patterns of co-morbidity. Fewer women were smokers than men, but in the fully adjusted model, differences between men and women were not statistically significant (OR 0.99, 95% CI 0.95 to 1.03).

The odds of being a current smoker decreased with age, with lower odds for each age group compared to the reference group of under-55 year-olds (42.8% of whom were current smokers). The percentage of current smokers rose with increasing deprivation, from 11.5% in the most affluent quintile to 30.4% in the most deprived. In the adjusted model, the odds of being a current smoker increased with each quintile of increased deprivation, such that those in the most deprived quintile had nearly three times the odds of being a current smoker compared to those in the most affluent quintile (OR 2.76, 95% CI 2.49 to 3.05).

In terms of the effect of different patterns of co-morbidity, for people with one concordant physical co-morbidity, the odds of being a current smoker were reduced compared to those without (OR 0.88, 95% CI 0.84 to 0.93). For those with 2 or more concordant co-

morbidities, the odds ratio of being a smoker was not statistically significantly different. The odds of being a current smoker also decreased with additional discordant physical co-morbidities, from OR 0.86 (95% CI 0.83 to 0.90) for those with one discordant physical condition to OR 0.72 (95% CI 0.69 to 0.75) for those with two or more. Those with two or more co-morbid mental health conditions had more than twice the odds of being current smokers as those without (OR 2.11, 95% CI 1.99 to 2.24).

Smoking cessation advice

15,395 (91.9%) current smokers were recorded as being given smoking cessation advice in the previous 15 months. Table 4 presents the multilevel binary logistic regression model for receipt of smoking cessation advice by current smokers. In the adjusted model, women had slightly higher odds of receiving smoking cessation advice compared to men (OR 1.15, 95% CI 1.01 to 1.30), although absolute differences were small.

In terms of deprivation status, adults with CHD from the most deprived quintile had lower odds of receiving smoking cessation advice compared to those in the most affluent quintile in the unadjusted model, but this was no longer statistically significant after adjustment (OR 0.80, 95% CI 0.62 to 1.02). It is worth noting that more than 90% of smokers in every quintile received advice, which was the QOF threshold for this target.

Those with concordant physical conditions were more likely to receive smoking advice than those without, with OR 2.10 (95% CI 1.77 to 2.51) for those with two or more concordant physical conditions compared to those with none, but with small absolute differences (94.1% compared to 89.1%). There was a similar, though less marked, relationship between additional discordant physical conditions and receipt of smoking cessation advice. Those

with mental health conditions had significantly lower odds of receiving smoking cessation advice (e.g. OR 0.74, 95% CI 0.62 to 0.88 for those with one mental health co-morbidity) but again, absolute differences were small.

Smoking cessation medication

There were 2427 (14.5%) current smokers who received a prescription for NRT in the 15 months prior to data collection. Table 5 presents the multilevel binary logistic regression model for receipt of NRT by current smokers.

A greater proportion of women who were current smokers (17.1%) received NRT compared to men (12.8%; OR 1.48, 95% CI 1.35 to 1.62). The proportion of smokers receiving NRT decreased with age, such that 21.2% of those smokers aged under 55 received NRT, compared to just 7.1% of those aged 75 years and older (OR 0.22, 95% CI 0.19 to 0.27). In terms of deprivation, the percentage of smokers receiving NRT increased from 11.8% in the most affluent quintile to 15.7% in the most deprived quintile (OR 1.41, 95% CI 1.11 to 1.80).

In terms of different patterns of co-morbidity, the percentage of smokers receiving NRT was 13.2% for those with no concordant physical conditions and 15.4% for those with 2 or more concordant physical conditions (OR 1.39, 95% CI 1.24 to 1.56), with similar percentages for discordant physical conditions. Smokers with one or more mental health condition were more likely to receive NRT (16.7% for one condition and 16.2% for two or more) than those without any mental health co-morbidity (13.1%). In the adjusted model, however, the OR was only significant for those smokers with one mental health condition (OR 1.18, 95% CI 1.07 to 1.31).

DISCUSSION

Summary

This large nationally representative cross-sectional study has highlighted marked differences in smoking status among adults with coronary heart disease, by age, sex, deprivation and different patterns of co-morbidity. Younger adults (<55 years), those living in the most deprived areas and those with mental health co-morbidities were more likely to be current smokers.

The quality of smoking cessation care provided in primary care was generally high, with smoking status recorded in 99.6% of people with CHD, and recent smoking cessation advice recorded for 91.9% of current smokers, with only small absolute differences between groups. There was a modest but consistent trend for higher NRT prescription amongst those more deprived and those with more co-morbidities.

Strengths and limitations

The strengths of this study include the large size of the dataset (over 80,000 people with CHD), the fact it was nationally representative, and the relatively large number of co-morbid conditions included. Limitations include it being a cross-sectional study so it is not possible to ascertain causality or temporality of any of the observed associations. As with any secondary data analysis, the quality and validity of the findings are only as good as the quality of the original data. In this case, confidence in the accuracy and consistency of the data is increased as the main outcome variables of interest were either collected routinely for QOF or were prescribing data, which are known to be well recorded.⁽¹⁹⁾ With regard to NRT prescriptions, the observed trend for higher NRT prescriptions among those more deprived and those with more co-morbidities should be interpreted with caution, as the findings do not

account for over-the-counter (OTC) NRT, which was widely available at relatively low cost in the UK at the time of the study, but may be more affordable and accessible to the more affluent.(20, 21)

Finally, we are unable to say what sort of smoking cessation advice was given or how often this was reinforced. The content and quality of GP 'brief advice' varies considerably, but this is not captured in our data; an important caveat when interpreting these results.(22, 23) Previous studies have demonstrated reluctance by GPs to discuss smoking in depth, with only a fraction of opportunities to give smoking advice taken up.(24, 25) The reasons for this reluctance are complex, but include lack of time, lack of confidence, and concerns about the impact on the doctor-patient relationship.(26, 27)

Comparison with existing literature

This study is one of only two that we are aware of that have assessed the associations between different patterns of co-morbidity and smoking rates and smoking cessation interventions in primary care for patients with coronary heart disease, and is the first to have examined 'concordant' co-morbidities in this regard. Consistent with this paper, Hippisley-Cox et al examined people with CHD and 'serious mental health' co-morbidity (predominately schizophrenia or bipolar disorder) and found that most CHD care indicators – including recording of smoking status and smoking cessation advice – were achieved equally for patients with and without a serious mental health problem.(28)

Individuals with CHD and one or more mental health co-morbidity were more likely to be current smokers than those without, a finding that is consistent with previous research.(29-31)

The quality of care for physical health problems in people with mental health conditions has come under scrutiny.(5, 32) In a US study, smoking cessation counselling was included as one of five quality indicators used to compare the quality of care among patients with or without mental illness and the impact of this on risk of mortality 1 year post-MI was examined.(33) Deficits in quality of care explained a substantial proportion of the excess mortality experienced by people with mental disorders after MI, but differences in smoking cessation counselling did not contribute to this.

Implications for research and practice

In this study approximately 85% of current smokers did not receive any NRT. This may simply reflect the best practice recommendations to only prescribe NRT to those who are committed to stopping smoking.(34) It is clear, however, that we need better ways of converting people with CHD who are current smokers into non-smokers, particularly for those from more deprived areas and those with mental health co-morbidity.

Current NHS stop smoking services are reaching disadvantaged smokers,(35) but a number of other barriers exist, including more challenging life circumstances, lack of social support, and higher nicotine dependency.(36-38) There are no easy solutions to these challenges,(39) but more proactive identification of smokers who want to quit, with referral to smoking cessation services, has been shown to increase quit attempts in previous primary care-based studies.(40, 41)

With regard to mental health co-morbidity, the RCGP has produced succinct primary care guidance on smoking and mental health, which outlines the physical, mental and financial benefits of stopping smoking, and provides practitioners with advice on medication dose adjustment and monitoring of mental health during smoking cessation attempts.(42) Clear

communication and co-ordination between smoking cessation services and prescribers in primary and secondary care is recommended.

This study adds to a growing body of research that explores the effect of different combinations of co-morbidity on quality of care outcomes.(3, 43, 44) The grouping of concordant ‘vascular’ physical conditions that we used in this study may be useful to clinical practice in the future, as they share a common pathophysiology or management. The study also adds to the large body of evidence on disparities between those with physical and mental health problems.(5, 45, 46) Improving integration and co-ordination of care for people with multimorbidity is one of the key healthcare challenges of the 21st century.(47, 48)

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Ethical approval

The NHS National Research Ethics Service had previously approved the anonymous use of these data for research purposes, therefore this study did not need individual ethics approval.

Competing interests

The authors declare that they have no competing interests.

Authors’ contributions

DB carried out the analyses and drafted the initial manuscript and all other authors contributed to subsequent drafts. All authors read and approved the final manuscript.

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Table 1: Distribution of variables and outcomes

	No (%) of adults with CHD (N=81,456)
Sex	
Men	46,648 (57.0)
Women	34,988 (43.0)
Age group	
<55 years	6,003 (7.4)
55-64	15,751 (19.3)
65-74	26,000 (31.9)
≥75	33,702 (41.4)
Deprivation quintile	
1 (least deprived)	12,667 (15.6)
2	17,278 (21.2)
3	19,058 (23.4)
4	16,554 (20.3)
5 (most deprived)	15,899 (19.5)
Concordant physical conditions	
0	21,261 (26.1)
1	29,100 (35.7)
≥2	31,095 (38.2)
Discordant physical conditions	
0	24,764 (30.4)
1	24,591 (30.2)
≥2	32,101 (39.4)
Mental health conditions	
0	55,475 (68.1)
1	17,295 (21.2)
≥2	8,686 (10.7)
Smoking status	
Never smoker	28,423 (34.9)
Ex-smoker	35,967 (44.2)
Current smoker	16,745 (20.6)
No (%) of current smokers only (N = 16,745)	
Smoking cessation advice	
No	1350 (8.1)
Yes	15395 (91.9)
NRT prescribed	
No	14318 (85.5)
Yes	2427 (14.5)

* Smoking status was not recorded for 321 cases. CHD = coronary heart disease

Table 2: Characteristics of total study population by smoking status, and of current smokers by receipt of smoking cessation advice and receipt of NRT

	Smoking status*, no. (% in each category)			For current smokers only (n=16,745)	
	Never (n=28,423)	Ex (n=35,967)	Current (n=16,745)	Smoking cessation advice, no. (%)	NRT prescribed, no. (%)
Sex					
Men	12,484 (27.0)	23,818 (51.4)	10,013 (21.5)	9,160 (91.5)	1,277 (12.8)
Women	15,939 (45.8)	12,149 (34.9)	6,732 (19.2)	6,235 (92.6)	1,150 (17.1)
Age group					
<55 years	1,414 (23.7)	1,990 (33.3)	2,571 (42.8)	2,323 (90.4)	545 (21.2)
55-64	4,077 (25.9)	6,572 (41.8)	5,082 (32.3)	4,734 (93.2)	906 (17.8)
65-74	8,075 (31.1)	12,313 (47.4)	5,569 (21.4)	5,166 (92.8)	726 (13.0)
≥75	14,857 (44.4)	15,092 (45.1)	3,523 (10.5)	3,172 (90.0)	250 (7.1)
Deprivation quintile					
1 (least deprived)	5,402 (42.8)	5,773 (45.7)	1,446 (11.4)	1,338 (92.5)	170 (11.8)
2	6,491 (37.8)	7,976 (46.5)	2,701 (15.6)	2,460 (91.1)	353 (13.1)
3	6,644 (35.0)	8,599 (45.3)	3,751 (19.7)	3,478 (92.7)	556 (14.8)
4	5,368 (32.5)	7,123 (43.1)	4,020 (24.3)	3,750 (93.3)	588 (14.6)
5 (most deprived)	4,518 (28.5)	6,496 (41.0)	4,827 (30.4)	4,369 (90.5)	760 (15.7)
Concordant physical conditions					
0	7,166 (34.0)	8,859 (42.0)	5,082 (24.1)	4,526 (89.1)	671 (13.2)
1	10,866 (37.5)	12,518 (43.2)	5,606 (19.3)	5,169 (92.2)	824 (14.7)
≥2	10,391 (33.5)	14,590 (47.0)	6,057 (19.5)	5,700 (94.1)	932 (15.4)
Discordant physical conditions					
0	8,065 (34.0)	10,423 (42.3)	6,130 (24.9)	5,548 (90.5)	814 (13.3)
1	8,441 (34.4)	10,857 (44.3)	5,216 (21.3)	4,826 (92.5)	764 (14.6)
≥2	11,917 (37.2)	14,687 (45.9)	5,399 (16.9)	5,021 (93.0)	849 (15.7)
Mental health conditions					
0	19,971 (36.1)	25,442 (46.0)	9,869 (17.9)	9,132 (92.5)	1,292 (13.1)
1	5,612 (32.6)	7,291 (42.4)	4,312 (25.0)	3,909 (90.7)	719 (16.7)
≥2	2,840 (32.9)	3,234 (37.4)	2,564 (29.7)	2,354 (91.8)	416 (16.2)

* Smoking status was not recorded for 321 cases

Table 3: Logistic regression model for being a current smoker (n = 81,456)

Variable	No. (%) who are current smokers	Unadjusted OR [95% CI]	Adjusted OR† [95% CI]	P-value
Sex				
Men	10,013 (21.5)	1	1	
Women	6,732 (19.2)	0.84 [0.81 to 0.88]	0.99 [0.95 to 1.03]	0.66
Age group				
<55 years	2,571 (42.8)	1	1	
55-64 years	5,082 (32.3)	0.65 [0.61 to 0.70]	0.69 [0.65 to 0.74]	<0.001
65-74 years	5,569 (21.4)	0.37 [0.35 to 0.40]	0.42 [0.39 to 0.45]	<0.001
≥75 years	3,523 (10.5)	0.17 [0.15 to 0.18]	0.18 [0.17 to 0.20]	<0.001
Deprivation quintile				
1 (least dep)	1,446 (11.4)	1	1	
2	2,701 (15.6)	1.40 [1.28 to 1.53]	1.38 [1.27 to 1.50]	<0.001
3	3,751 (19.7)	1.75 [1.59 to 1.94]	1.70 [1.55 to 1.86]	<0.001
4	4,020 (24.3)	2.33 [2.12 to 2.55]	2.22 [2.04 to 2.42]	<0.001
5 (most deprived)	4,827 (30.4)	2.93 [2.63 to 3.27]	2.76 [2.49 to 3.05]	<0.001
Concordant physical conditions				
0	5,082 (24.1)	1	1	
1	5,606 (19.3)	0.74 [0.70 to 0.78]	0.88 [0.84 to 0.93]	<0.001
≥2	6,057 (19.5)	0.73 [0.70 to 0.77]	0.98 [0.93 to 1.03]	0.50
Discordant physical conditions				
0	6,130 (24.9)	1	1	
1	5,216 (21.3)	0.79 [0.76 to 0.83]	0.86 [0.83 to 0.90]	<0.001
≥2	5,399 (16.9)	0.59 [0.56 to 0.61]	0.72 [0.69 to 0.75]	<0.001
Mental health conditions				
0	9,869 (17.9)	1	1	
1	4,312 (25.0)	1.45 [1.39 to 1.52]	1.56 [1.49 to 1.64]	<0.001
≥2	2,564 (29.7)	1.83 [1.73 to 1.94]	2.11 [1.99 to 2.24]	<0.001

Note: CI = confidence interval, OR = odds ratio

† Adjusted for all other variables

Table 4: Logistic regression model for receipt of smoking cessation advice by current smokers (n = 16,745)

Variable	No. of current smokers (%) who received smoking cessation advice	Unadjusted OR [95% CI]	Adjusted OR† [95% CI]	P-value
Sex				
Men	9,160 (91.5)	1	1	
Women	6,235 (92.6)	1.20 [1.06 to 1.35]	1.15 [1.01 to 1.30]	0.04
Age group				
<55 years	2,323 (90.4)	1	1	
55-64 years	4,734 (93.2)	1.55 [1.27 to 1.87]	1.35 [1.11 to 1.63]	0.002
65-74 years	5,166 (92.8)	1.50 [1.25 to 1.80]	1.14 [0.95 to 1.37]	0.15
≥75 years	3,172 (90.0)	1.12 [0.89 to 1.42]	0.80 [0.63 to 1.02]	0.07
Deprivation quintile				
1 (least dep.)	1,338 (92.5)	1	1	
2	2,460 (91.1)	1.06 [0.81 to 1.39]	1.03 [0.79 to 1.35]	0.83
3	3,478 (92.7)	0.86 [0.66 to 1.12]	0.84 [0.64 to 1.08]	0.18
4	3,750 (93.3)	0.92 [0.71 to 1.20]	0.89 [0.69 to 1.15]	0.38
5 (Most deprived)	4,369 (90.5)	0.84 [0.65 to 1.08]	0.80 [0.62 to 1.02]	0.07
Concordant physical conditions				
0	4,526 (89.1)	1	1	
1	5,169 (92.2)	1.56 [1.34 to 1.81]	1.54 [1.33 to 1.78]	<0.001
≥2	5,700 (94.1)	2.11 [1.77 to 2.52]	2.10 [1.77 to 2.51]	<0.001
Discordant physical conditions				
0	5,548 (90.5)	1	1	
1	4,826 (92.5)	1.31 [1.15 to 1.50]	1.28 [1.11 to 1.46]	<0.001
≥2	5,021 (93.0)	1.41 [1.22 to 1.62]	1.34 [1.15 to 1.56]	<0.001
Mental health conditions				
0	9,132 (92.5)	1	1	
1	3,909 (90.7)	0.81 [0.68 to 0.96]	0.74 [0.62 to 0.88]	0.001
≥2	2,354 (91.8)	0.89 [0.71 to 1.12]	0.77 [0.61 to 0.98]	0.03

Note: CI = confidence interval, OR = odds ratio

† Adjusted for all other variables

Table 5: Logistic regression model for receipt of NRT by current smokers (n = 16,745)

Variable	No. (%) who received NRT	Unadjusted OR [95% CI]	Adjusted OR† [95% CI]	P-value
Sex				
Male	1,277 (12.8)	1	1	
Female	1,150 (17.1)	1.41 [1.29 to 1.55]	1.48 [1.35 to 1.63]	<0.001
Age group				
<55 years	545 (21.2)	1	1	
55-64 years	906 (17.8)	0.81 [0.71 to 0.92]	0.74 [0.65 to 0.84]	<0.001
65-74 years	726 (13.0)	0.56 [0.50 to 0.64]	0.48 [0.42 to 0.54]	<0.001
≥75 years	250 (7.1)	0.29 [0.24 to 0.34]	0.22 [0.19 to 0.27]	<0.001
Deprivation quintile				
1 (least dep)	170 (11.8)	1	1	
2	353 (13.1)	1.23 [0.96 to 1.58]	1.20 [0.93 to 1.54]	0.15
3	556 (14.8)	1.35 [1.06 to 1.72]	1.27 [1.00 to 1.61]	0.05
4	588 (14.6)	1.37 [1.09 to 1.72]	1.26 [1.00 to 1.58]	0.05
5 (most deprived)	760 (15.7)	1.61 [1.27 to 2.04]	1.41 [1.11 to 1.80]	0.004
Concordant physical conditions				
0	671 (13.2)	1	1	
1	824 (14.7)	1.13 [1.01 to 1.27]	1.21 [1.07 to 1.36]	0.002
≥2	932 (15.4)	1.20 [1.07 to 1.35]	1.39 [1.24 to 1.56]	<0.001
Discordant physical conditions				
0	814 (13.3)	1	1	
1	764 (14.6)	1.12 [1.00 to 1.26]	1.14 [1.01 to 1.29]	0.04
≥2	849 (15.7)	1.24 [1.11 to 1.38]	1.32 [1.17 to 1.49]	<0.001
Mental health conditions				
0	1,292 (13.1)	1	1	
1	719 (16.7)	1.32 [1.19 to 1.47]	1.18 [1.07 to 1.31]	0.003
≥2	416 (16.2)	1.24 [1.10 to 1.41]	1.05 [0.91 to 1.20]	0.50

Note: CI = confidence interval, OR = odds ratio

† Adjusted for all other variables

APPENDIX 1 – Read codes for the three smoking-related outcome variables

Smoking Status

Read Code	Description	Coding
137..	Tobacco consumption	2
1371.	Never smoked tobacco	0
1372.	Trivial smoker <1 cig/day	2
1373.	Light smoker 1-9 cigs/day	2
1374.	Moderate smoker 10-19 cigs/day	2
1375.	Heavy smoker 20-39 cigs/day	2
1376.	Very heavy smoker 40+ cigs/day	2
1377.	Ex-trivial smoker (<1/day)	1
1378.	Ex-light smoker (1-9/day)	1
1379.	Ex-moderate smoker (10-19/day)	1
137A.	Ex-heavy smoker (20-39/day)	1
137B.	Ex-very heavy smoker (40+/day)	1
137C.	Keeps trying to stop smoking	2
137D.	Admitted tobacco cons untrue	SYSMIS
137E.	Tobacco consumption unknown	SYSMIS
137F.	Ex-smoker – amount unknown	1
137G.	Trying to give up smoking	2
137H.	Pipe smoker	2
137I.	Passive smoker	SYSMIS
137J.	Cigar smoker	2
137K.	Stopped smoking	1
137L.	Current non-smoker	1
137M.	Rolls own cigarettes	2
137N.	Ex-pipe smoker	1
137O.	Ex-cigar smoker	1
137P.	Cigarette smoker	2
137Q.	Smoking started	2
137R.	Current smoker	2

137S.	Ex-smoker	1
137Z.	Tobacco consumption NOS	2

SYSMIS = missing.

Smoking cessation advice

Read Code	Description	Coding
900Z.	Stop-smoking monitor administration NOS	1
900A.	Stop-smoking monitor check done	1
9009.	Stop-smoking monitoring deletion	1
9007.	Stop-smoking monitor verbal interview	1
9002.	Refuses stop-smoking monitor	0
9001.	Attends stop-smoking monitor	1
900..	Anti-smoking monitoring administration	1
9N4M.	Did not attend smoking cessation advice	0
8HTK.	Referral to stop-smoking clinic	1
8H7i.	Referral to smoking cessation adviser	1
8CAL.	Smoking cessation advice	1
8B3Y.	Over-the-counter nicotine replacement therapy provided free	1
8B2B.	Nicotine replacement therapy	1
67H1.	Lifestyle advice re: smoking	1
6791.	Health education - smoking	1
13p5.	Smoking cessation programme start date	1
13p1.	Smoking status at 4 weeks	1
13p...	Smoking cessation milestones	1

Smoking cessation medication

With regard to the recording of NRT prescriptions, there were 123 different ways of recording these prescriptions, including brand names and different forms of delivery (e.g. lozenges, patches, gum). For the purposes of re-coding, all of the 123 different names began with just seven different combinations of first letters – Niq, NiQ, NIQ, niq, Nic, NIC, and nic. Again, a binary variable was formed with “NRT not prescribed” (0) versus “NRT prescribed” (1).

APPENDIX 2 – The three patterns of co-morbid conditions, with their prevalences

Concordant Physical Co-morbidity	Prevalence (%)
Hypertension	51.7
Diabetes	21.5
Chronic Kidney Disease	14
COPD/Bronchitis	13.3
Stroke/TIA	13.1
Peripheral Vascular Disease	9.2
Asthma	7.5
Bronchiectasis	0.5
Mental health Co-morbidity	Prevalence (%)
Depression	16.9
Anxiety	10.5
Psychoactive drugs	8.9
Alcohol	4.8
Dementia	3.1
Schizophrenia/Bipolar Disorder	0.9
Anorexia/Bulimia	0.2
Learning Disability	0.1
Discordant Physical Co-morbidity	Prevalence (%)
Pain	24.2
Heart Failure	13.8
Rheumatoid Arthritis	12.0
Thyroid disorders	11.8
Atrial Fibrillation	11
Constipation	10.5
Hearing loss	10.3
Diverticular disease	10.0
Cancer	7.8
Dyspepsia	7.0

Irritable Bowel Syndrome	4.8
Prostate problems	4.2
Glaucoma	3.6
Blindness	2.1

Other discordant physical conditions with prevalence of less than 2% in the sample population: Epilepsy (1.2), Psoriasis/Eczema (1.2), Inflammatory Bowel Disease (1.1), Parkinsons (0.8), Chronic sinusitis (0.8), Migraine (0.6), Chronic Liver Disease (0.4), MS (0.2), and Viral hepatitis (0.0)