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The effect of proactively identifying smokers and offering smoking cessation support in primary care populations: a cluster-randomized trial

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ABSTRACT

Aims To establish whether proactively identifying all smokers in primary care populations and offering smoking cessation support is effective in increasing long-term abstinence from smoking. **Design** Cluster randomized controlled trial. **Setting** Twenty-four general practices in Nottinghamshire, randomized by practice to active or control intervention. **Participants** All adult patients registered with the practices who returned a questionnaire confirming that they were current smokers ($n = 6856$). **Intervention** Participants were offered smoking cessation support by letter and those interested in receiving it were contacted and referred into National Health Service (NHS) stop smoking services if required. **Measurements** Validated abstinence from smoking, use of smoking cessation services and number of quit attempts in continuing smokers at 6 months. **Findings** Smokers in the intervention group were more likely than controls to report that they had used local cessation services during the study period [16.6% and 8.9%, respectively, adjusted odds ratio (OR) 2.09, 95% confidence interval (CI) 1.57–2.78], and continuing smokers (in the intervention group) were more likely to have made a quit attempt in the last 6 months (37.4% and 33.3%, respectively, adjusted OR 1.23, 95% CI 1.01–1.51). Validated point prevalence abstinence from smoking at 6 months was higher in the intervention than the control groups (3.5% and 2.5%, respectively) but the difference was not statistically significant (adjusted OR controlling for covariates: 1.64, 95% CI 0.92–2.89). **Conclusions** Proactively identifying smokers who want to quit in primary care populations, and referring them to a cessation service, increased contacts with cessation services and the number of quit attempts. We were unable to detect a significant effect on long-term cessation rates, but the study was not powered to detect the kind of difference that might be expected.

Keywords Adult smokers, behavioural support, long-term abstinence, primary care, proactive identification, quit attempts, smoking cessation.

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INTRODUCTION

Tobacco smoking is the largest avoidable cause of premature death and disability in the world [1]. Among men, smoking is responsible for over half the excess risk of premature death between the highest and lowest socioeconomic groups [2]. Helping smokers to quit smoking is one of the most cost-effective medical interventions [3], and in recent years the UK National Health Service (NHS) has established a national network of cessation services to provide behavioural support and pharmacotherapy for all smokers who want to quit. However, although increasing, uptake of these services by smokers is still low [4], as only about 10% of smokers in the United Kingdom used a cessation service in 2005 [5]. It is therefore important to develop strategies to encourage smokers to use the cessation services that are now available to them.

One simple option is to identify individual smokers proactively, and inform them about available cessation services. Previous studies of proactive approaches to promote smoking cessation have demonstrated, at most, only modest effects from provision of self-help materials

[6] or telephone counselling [7], but a study from the United States, combining a proactive approach to primary care patients with an intervention that informed smokers about a local intensive smoking cessation programme, found a marked increase in recruitment into smoking cessation programmes [8]. We have found previously that many smokers were unaware of the smoking cessation services available to them, but believed that a personal invitation to, and information about, these services would make them more likely to use them [9].

We have therefore carried out a cluster randomized controlled trial to determine whether identifying all smokers in a primary care population, followed by personal contact giving advice and information about local cessation services, is effective in promoting biochemically validated smoking cessation.

METHODS

Study design

We designed a cluster-randomized trial to randomize smokers from 24 primary care practices to receive either an active intervention or usual care. In 2005, we wrote to all 90 practices with up to 10 000 patients in three Nottingham Primary Care Trust areas to request their participation, and 27 practices expressed interest. We selected randomly 24 practices and allocated these to either intervention or control groups by simple randomization; two practices withdrew at an early stage and were replaced with two of the remaining consenting practices (again selected at random). In both groups, we used practice records to identify all patients aged 18 years or over who were either recorded as smokers, or had no smoking status recorded. These patients were sent a short self-completion questionnaire from the participating practice, with a covering letter explaining that the practice was using the questionnaire to update medical records and for a research study aimed at helping smokers to quit. In accordance with the approval for the study given by the Nottingham Ethics Committee, respondents were asked to provide written consent for the information provided on the questionnaire to be seen by the research team.

The contents of the letters and questionnaires to patients in the intervention and control practices were identical to try to ensure that the initial contact with, and response from, participants was comparable between the two groups. The questionnaire confirmed current smoking status by asking respondents whether they had smoked any cigarettes or tobacco in the last 12 months, the frequency of smoking (every day, most days or occasionally) and number of cigarettes smoked per day (≤10, 11–20, 21–30, 31–40, 41+). The questionnaire also asked current smokers whether they would like to speak to a smoking cessation adviser to receive help or advice to quit smoking and, if so, to provide telephone contact details so that a smoking cessation adviser could contact them. Respondents were given an option to receive postal information if they were not contactable by telephone. All subjects were told that this contact might happen after a short delay, as was the case for those in the control group.

Letters to patients in each practice were posted over a period of a few days for each practice, and in random order of practices over a 6-month period. The date of distribution of the initial letter was defined as baseline for each practice. Completed questionnaires were returned to the practice, and a reminder was sent to non-responders 3 weeks after baseline.

Study participants were identified as all current smokers (those reporting that they smoke every day, most days or occasionally) at baseline in intervention or control practices who had provided consent for their details to be seen by the research team.

Intervention group

All smokers in the intervention group who indicated they would like help or advice to quit smoking were contacted by the research team. All members of the research team undertook the same basic training as that of NHS stop smoking advisers and all calls followed a similar format. Patients were asked if they were still interested in stopping smoking and if so, were given brief advice on smoking cessation in accordance with evidence-based guidelines [10], and information about their local NHS stop smoking service (SSS) and the benefits this could offer. If desired, an appointment with the NHS SSS was booked by the research team on their behalf, and if not smokers were sent an information pack about the local service. The information pack included an information leaflet from the service, encouragement to the smoker to use the service, and contact details for the research team and the local NHS SSS for further information or to book an appointment. Smokers who were not contactable by telephone were sent the postal information pack detailed above. These contacts were all made within 8 weeks of baseline for each practice.

Smokers who attended the local NHS SSS received an initial consultation with a trained adviser who offered the standard range of evidence-based smoking cessation interventions offered by services throughout England [11], including the option of one-to-one or group behavioural support lasting an average of 8 weeks, and nicotine replacement or bupropion therapy, depending on the preferences and needs of the smoker. At the initial consultation, smokers were asked to provide their age, sex, ethnicity, postcode and employment status. They were

also asked a series of questions about their smoking behaviour, including amount smoked, reasons for smoking, number of previous quit attempts and motivation to quit. The SSS advisers also recorded whether the smoker set a quit date while using the local NHS SSS, and smoking status at 4 weeks after the quit date. These data, which are collected routinely by the NHS SSS, were provided to the research team in an anonymized form for clients who used the service in the period of the study and for the same period of the previous year (June–December) to determine whether the intervention had altered the characteristics of service attendees.

Control group

For 6 months from baseline, smokers in the control practices received no further intervention other than that provided by usual care. Previous studies suggest that, in most cases, little or no advice or support would have been given [12].

Follow-up

Seven months after baseline, and an average of 6 months after the research team contacted smokers from each intervention practice, a follow-up questionnaire was sent to all current smokers at baseline who gave consent for their information to be provided to the research team. This questionnaire repeated the questions asked at baseline, plus questions about current desire to quit, the number of quit attempts made and the number of attempts that had lasted more than 24 hours, receipt of smoking cessation advice and any use of any smoking cessation service over the previous 6 months. Respondents who indicated that they were abstinent at 6 months were asked to consent to further contact with the research team to provide a sample of saliva for cotinine estimation, or exhaled air for carbon monoxide measurement in those who reported they were still using nicotine replacement therapy to validate smoking status. Those consenting to provide samples were given the option of a visit from the research team at home or work, or attending Nottingham City Hospital for sample collection. We made up to six attempts to contact these individuals at different times of the day. Saliva cotinine concentrations were measured by enzyme-linked immunosorbent assay (ELISA) (Salimetrics, PA, USA). Non-smokers were defined as those with a salivary cotinine level below 15 ng/ml [13] or, if using nicotine replacement therapy (NRT), an exhaled carbon monoxide level below 10 parts per million (p.p.m.) [14].

After the follow-up measurements were complete, smokers in the control group who indicated that they would like help or advice to stop smoking were themselves contacted by the local NHS SSS to offer specialist cessation support.

Data analysis

Because smoking status in primary care records is incomplete and can be inaccurate [15], we estimated the number of true current smokers in intervention and control practices at baseline using the responses to the baseline questionnaire (details below), and used these estimates in turn as the denominators to estimate the response rates in our study. We estimated the number of true current smokers in each practice by calculating the proportion of those documented to be smokers in medical records, and of those with no recorded smoking status, who confirmed in the baseline questionnaire that they were current smokers, and applying these proportions to the total number of documented smokers and those with no smoking status in each practice. The estimated number of true current smokers therefore uses questionnaire responses as a 'gold standard' for current smoking status and corrects for the fact that smoking status recorded in medical records becomes inaccurate with time elapsing after this is ascertained as some smokers tend to stop smoking as they age.

Our primary outcome was 7-day validated point prevalence abstinence from smoking at the 6-month follow-up. We assumed that all non-responders, and those who did not provide a validation sample at 6 months, were still smoking. Secondary outcomes included self-reported abstinence for the past 7 days at 6 months, calculated for all those smoking at baseline, the proportion of smokers who reported using the local NHS SSS or receiving smoking cessation advice, calculated for those who responded at 6 months, and the proportion of people who reported a desire to quit and had made at least one quit attempt lasting more than 24 hours, calculated for those who were still smoking at 6 months. In those who were still smoking, a lower category of cigarette consumption at follow-up was taken as representing reduced cigarette consumption. Townsend scores based on patients' postcodes were calculated from 2001 census data, which have been shown to explain most of the variation in health measures and adhere most closely to the concept of material disadvantage [16], were used to adjust for socio-economic status.

For each primary and secondary outcome, we calculated the percentage of positive responses for each practice and compared the means of these percentages between intervention and control practices by an independent samples *t*-test, having first checked the normality of the distribution of percentages. To obtain odds ratios and to adjust for apparent baseline differences

Table 1 Characteristics of the intervention and control practices and participants at baseline.

	Intervention		*Control*	
	Individual (%)	*Mean per practice (range)*	*Individual (%)*	*Mean per practice (range)*
Estimated number of eligible individuals (smokers aged 18 or over)	10 177	848 (307–1834)	11 783	982 (312–2070)
Number of participants	3 051 (30.0)	254 (52 529)	3 805 (32.3)	317 (53 766)
Age (years)				
18–39	1 082 (35.5)	36.6	1 510 (39.7)	39.7
40–59	1 276 (41.8)	41.5	1 536 (40.4)	40.3
60+	693 (22.7)	21.9	759 (19.9)	20.1
Mean age	46.6	46.1 (39.2–49.4)	45.0	44.9 (39.2–48.8)
Gender				
Male	1 584 (51.9)	54.9 (43.5–69.2)	1 932 (50.8)	51.5 (47.1–58.5)
Female	1 467 (48.1)		1 873 (49.2)	
Townsend score				
≤–1.6	430 (14.3)		943 (25.0)	
–1.599–0.497	451 (15.0)		892 (23.7)	
0.498–3.037	550 (18.3)		785 (20.8)	
3.038–5.098	752 (25.1)		610 (16.2)	
≥5.099	816 (27.2)		538 (14.3)	
Missing	52		37	
Mean Townsend score	2.71 (3.39)	2.73 (–0.42–5.14)	1.05 (3.35)	1.43 (–1.24–5.49)
Cigarettes/day				
<10	944 (30.9)		1 382 (36.3)	
11–20	1 357 (44.5)		1 507 (39.6)	
21–30	422 (13.8)		545 (14.3)	
31–40	98 (3.2)		125 (3.3)	
41+	33 (1.1)		26 (0.7)	
No response	197 (6.5)		220 (5.8)	

between practices, we used logistic regression in MLwiN version 2.02 [17]. We used a two-level hierarchical model with subjects nested within practices, a random effect of practice, intervention fitted at the practice level, and age, sex, Townsend score and amount smoked per day at the subject level. With 12 practices in each treatment group, and expecting to recruit 500 smokers per practice and assuming an intracluster correlation coefficient of not more than 0.007 [18], the study was designed to have 80% power to detect a change from a quit rate of 2.5% in the control group to 4% in the intervention group (an OR of 1.625). Characteristics of service attendees between the period of the study and the same months in the previous year were compared by an independent samples *t*-test, Mann–Whitney *U*-test for non-normally distributed data, or χ^2 test for categorical data. We carried out a *post hoc* subgroup analysis of validated and self-reported abstinence at 6-month follow-up in those who responded to the initial questionnaire that they wanted help or advice from a smoking cessation adviser.

RESULTS

In intervention and control practices, there were 10 402 and 12 642 patients, respectively, aged 18 years or over recorded as smokers, and 6523 and 5665 with no record of smoking status in their medical records. We estimate the total number of true current smokers in intervention and control practices at baseline to have been 10 177 and 11,783, respectively, of whom 3051 (30%) and 3805 (32%), respectively (total 6856) participated in our study (Table 1).

The distribution of gender and age was similar for participants in intervention and control practices (Table 1). Townsend scores were slightly higher (implying greater relative deprivation), and cigarette consumption also higher, for participants in intervention practices. A similar proportion of smokers in intervention and control practices requested help with quitting smoking [mean 40.6% (range 30.6–51.8) and 41.6% (range 36.4–50.2), respectively]. Of those requesting

Table 2 Effect of intervention versus control on main outcomes in all smokers responding at baseline.

Of all smokers participating at baseline	*Intervention mean % per practice (range)*	*Control mean % per practice (range)*	*Unadjusted OR (95% CI)*	*Adjusted OR* (95% CI)*
Self-reported smoking abstinence (last 7 days) at 6 months†	8.6 (5–14.4)	7.4 (2.3–12.1)	1.20 (0.86–1.69)	1.23 (0.90–1.67)
Validated smoking abstinence at 6 months†	3.5 (1.9–6.4)	2.5 (0–5.4)	1.60 (0.89–2.87)	1.64 (0.92–2.89)

*Adjusted for age, gender, quintiles of Townsend score and cigarette consumption at baseline. †Those who did not respond at 6 months presumed to be continuing to smoke. CI: confidence interval; OR: odds ratio.

Table 3 Effect of intervention versus control on main outcomes in all responders at 6 months.

Of all those responding at 6 months	*Intervention % per practice mean 125, range 15–277*	*Control % per practice mean 167, range 26–415*	*Unadjusted OR (95% CI)*	*Adjusted OR* (95% CI)*
Used local smoking cessation service	16.6 (11.6–22.4)	8.9 (4.9–13.8)	2.11 (1.61–2.76)	2.09 (1.57–2.78)
Given advice on quitting from any source	29.3 (13.3–38.6)	21.8 (15.3–38.5)	1.72 (1.38–2.16)	1.68 (1.36–2.07)

*Adjusted for age, gender, quintiles of Townsend score and cigarette consumption at baseline. CI: confidence interval; OR: odds ratio.

help from intervention practices, 67% received telephone contact from the research team. The remaining 33% were sent postal information, either at their request (12%) or because they were uncontactable by telephone (21%).

Of the 6856 participants at baseline, 3512 provided follow-up questionnaire data at 6 months. This proportion was similar in intervention and control practices, the mean response being 47.9% (range 28.8–55.6) and 53.7% (range 39.6–63.3), respectively. Of those smokers who reported that they had quit smoking, the proportion consenting for further contact for validation was similar between intervention and control groups (58.3% and 56.2%, respectively), but a higher proportion of these individuals in control practices (73.5%) than in the intervention group (56.7%) proved either to be not contactable or else refused subsequently to provide a sample.

There was no significant difference in self-reported point abstinence from smoking at 6 months in intervention and control groups (8.6% and 7.4%, respectively), either before or after adjusting for age, sex, Townsend score and amount smoked at baseline (Table 2). Of those who had quit by self-report 41.0% and 30.6% were, respectively, confirmed as non-smokers by salivary cotinine or exhaled carbon monoxide validation. The prevalence of validated point abstinence from smoking at 6 months was 3.5% and 2.5% in the intervention and control groups, respectively, and the difference between them was not statistically significantly different, either before or after adjustment for age, sex, Townsend score and amount smoked (adjusted OR 1.64, 95% CI 0.92, 2.89). There was no evidence of interaction between the effect of the intervention and Townsend score or cigarette consumption at baseline.

A significantly higher percentage of participants in the intervention group than in the control group reported that they had used the local smoking cessation service during the period of the study (16.6% and 8.9%, respectively), or had received advice on quitting from any source (29.3% and 21.8%, respectively). Some respondents indicated that they had tried to see an adviser from the local NHS SSS but were unable to make an appointment. An average of 17.9% of those in the intervention practices and 10.5% of those in the control practices either used, or tried to make an appointment with, the local NHS SSS during the course of the study (Table 3).

Among continuing smokers at follow-up, those in the intervention group were slightly more likely to have made a quit attempt during the course of the study (adjusted OR 1.23, 95% CI 1.01–1.51), although these attempts were no more likely to have lasted more than 24 hours than those in the control practices. Smokers in intervention practices were no more likely to have reduced their cigarette consumption over the 6 months, and were less

Table 4 Effect of intervention versus control on main outcomes in continuing smokers at 6 months.

Of current smokers responding at 6 months	*Intervention n per practice mean 102, range 12 210*	*Control n per practice mean 143, range 24 345*	*Unadjusted OR (95% CI)*	*Adjusted OR* (95% CI)*
Reduced cigarette consumption†	14.3 (7.3–22.0)	13.9 (4.2–18.0)	1.12 (0.89–1.41)	1.10 (0.86–1.40)
Want to quit	62.7% (57.6–75.0)	67.3% (59.7–75.0)	0.83 (0.70–0.98)	0.80 (0.67–0.94)
Tried to quit in last 6 months	37.4% (26.8–47.5)	33.3% (25.0–41.2)	1.22 (1.01–1.50)	1.23 (1.01–1.51)
At least one attempt lasting 24 hours or more	28.2% (19.0–39.0)	27.4% (21.4–36.0)	1.12 (0.94–1.39)	1.14 (0.92–1.42)

*Adjusted for age, gender, quintiles of Townsend score and cigarette consumption at baseline. †Adjusted for age, gender, quintiles of Townsend score only (for model convergence). CI: confidence interval; OR: odds ratio.

Table 5 Characteristics of service users during the study period, and for the same period in the preceding year.

	Year before study	*Year of study*	*P-value*
Number of users	3468	4148	
Mean age (years) ($n = 7616$)	43.1 (12–88)	41.9 (11–90)	<0.001
Mean Townsend score ($n = 7141$)	1.75 (−5.770–9.070)	1.69 (−6.510–9.070)	0.491
Gender % male ($n = 7616$)	41.2	43.0	0.122
Ethnicity % white Caucasian ($n = 7423$)	93.4	91.7	0.007
% Set quit date ($n = 7616$)	73.1	66.4	<0.001
% Quit at 4 weeks ($n = 7616$)*	41.8	40.9	0.442
Median (range) motivation to quit score ($n = 5976$)	9.0 (1–10)	9.0 (1–10)	0.096

*Clients lost to follow up assumed to be continuing to smoke at 4 weeks.

likely to want to quit at follow-up than their counterparts in the control practices (adjusted OR 0.80, 95% CI 0.67–0.94) (Table 4).

Characteristics of service users

More people attended the local NHS SSS during the period of the study than in the equivalent period of the previous year (Table 5). There was also a notable difference in the proportion of attendees who set a quit date, which at 66.4% in the study period was significantly lower than the 73.1% in the previous year (Table 5). There was a significant increase in the proportion of non-white Caucasian clients attending the local NHS SSS in the year of the study compared with the previous year, but no difference in socio-economic status.

Post-hoc analysis in the subgroup of smokers who wanted to speak to a smoking cessation adviser

In those smokers who indicated at baseline that they would like to speak to a smoking cessation adviser ($n = 1289$ and 1551 in the intervention and control practices, respectively), the response rate at 6-month follow-up was comparable with that for the complete study population. Validated quit rates were significantly higher in the intervention group than control (4.0% and 2.2%, respectively), although the difference in self-reported abstinence was not statistically significant (Table 6).

DISCUSSION

This study aimed to identify proactively smokers in primary care and offer help or advice about smoking cessation which, for those who requested it, included information about and referral to a range of evidence-based cessation support available through the UK NHS stop smoking services. We found that the intervention increased the proportion of smokers reporting attendance at the local NHS SSS and had a modest effect on the number of quit attempts made, but at the population level had no significant impact on actual quit rates or reported cigarette consumption.

The response rate to the initial questionnaire was low at around 30% of the estimated number of current smokers in the practices but, importantly, it was comparable between intervention and control practices so that this is unlikely to have introduced bias, but may limit the generalizability of our results. Both self-reported and validated control group cessation rates were higher than

Table 6 Effect of intervention versus control on main outcomes in those smokers who indicated they would like speak to a smoking cessation adviser at baseline.

Of all smokers who indicated they would like to speak to a smoking cessation adviser at baseline	*Intervention mean % per practice (range)*	*Control mean % per practice (range)*	*Unadjusted OR (95% CI)*	*Adjusted OR* (95% CI)*
Self-reported smoking abstinence (last 7 days) at 6 months†	7.5 (2.3–13.0)	5.9 (2.5–9.5)	1.35 (0.97–1.87)	1.37 (0.99–1.90)
Validated smoking abstinence at 6 months†	4.0 (0–10.0)	2.2 (0–4.0)	1.96 (1.08–3.58)	2.05 (1.11–3.76)

*Adjusted for age, gender, quintiles of Townsend score and cigarette consumption at baseline. †Those who did not respond at 6 months presumed to be continuing to smoke. CI: confidence interval; OR: odds ratio.

anticipated spontaneous quit rates (approximately 2% annually) [10] after 6 months, and this is due probably to over-representation of motivated smokers among our participants. While this response rate is not unusual for a community-based study, smokers may also have been deterred by the two-stage process imposed by ethical considerations of returning the questionnaire to the general practice and providing signed consent for these data to be seen by researchers.

The response rate at follow-up was also relatively low and there was a small difference in response between intervention and control groups, with poorer response from intervention group smokers, possibly as a result of response fatigue as some of this group would have been contacted in the interim. We have assumed that non-responders at follow-up were still smoking, as is standard practice in clinical trials; to the extent that this may not have been true in some cases, smoking cessation rates in both groups would have been underestimated and the marginally poorer response for intervention practices would have tended to reduce the apparent size of effect. This seems unlikely to have had more than a minimal impact on our results, however. We used validated point abstinence smoking cessation at 6 months rather than sustained abstinence over the 6 months, which might have been a better marker of life-time abstinence, but point abstinence was the only feasible outcome in this community-based study. Finally, although many smokers agreed in principle to provide samples for smoking status validation, it proved difficult to make face-to-face contact with many individuals, as is typical in this type of study [19]. Control group smokers who had received less contact with the research team, and were also more likely to be working, were less likely to provide samples and, as those who did not provide saliva samples were assumed to be smoking, this misclassification would tend to increase the apparent cessation rate in the intervention compared with control. Nevertheless, the results were consistent for both validated and non-validated measures of smoking cessation, with neither showing a significant difference.

We designed the study to detect a 1.5% point difference in cessation between active and control groups based on recruiting 500 smokers per practice. We did not achieve this sample size in a number of practices, and it remains possible that a true effect on cessation rates of this magnitude or smaller was missed. We observed a difference in quit rates attributable to the intervention of between 1 and 1.5% in all smokers, which although not statistically significant in this study is potentially important in public health terms. The magnitude of effect we found may also have been reduced by the fact that smokers in the intervention group were more deprived socio-economically and heavier smokers, and were therefore less likely to quit [20], although adjusting our findings for deprivation and cigarette consumption had little impact on the result. There was also no evidence of interaction between either deprivation or cigarette consumption and smoking cessation in our study, so these baseline chance differences are unlikely to explain our findings.

Smokers in the intervention group were more likely to have received advice on smoking cessation from any source during the period of study. It is surprising that this proportion for the intervention group is only 29%, as we provided advice by telephone or letter for the 40% who requested help or advice. This discrepancy is likely to be the result of poor recall of advice, or misunderstanding of what we meant by receiving advice from 'any source'. It is notable that smokers in the intervention group were less likely to want to quit at the end of the study than those in the control group, but this could be explained by their being more likely to have made a recent (unsuccessful) quit attempt.

Smokers in the intervention group reported a significantly higher use of NHS stop smoking services. However, as those seeking help to quit in the intervention group were aware that we had booked them an

appointment with the service they may have over-reported attendance. Attendance data collected by the NHS stop smoking service are anonymized and so we were unable to link these data and general practice data to determine if individuals actually attended the appointments booked for them. There was an increase in service usage during the period of our study, and while we cannot be sure that this increase was due to our study rather than other initiatives, it would be consistent with our intervention being effective in increasing the number of smokers contacting the service. When we compared the characteristics of those attending the local SSS during the course of our study with a similar time-period in the previous year, we found little evidence of a difference in socio-demographic characteristics, but service users in the period of our study were less motivated to quit and less likely to set a quit date than those attending in the previous year. It is possible that, by offering smoking cessation support proactively, we encouraged a group of smokers to access NHS SSS who were perhaps not as ready or motivated to quit as previous service users. Although our study was based in Nottinghamshire, a relatively deprived population, the local NHS SSS provides a standard range of evidence-based smoking cessation interventions with group or individual support at flexible times and locations which is typical of services available nationally [21], and as such our results are likely to be generalizable to deprived populations and NHS cessation services across the country.

In our primary analysis we compared smoking cessation at follow-up between all smokers in intervention and control practices, whether or not they asked for help or advice from a smoking cessation adviser. We took this approach to establish the public health impact of our intervention which encompassed a proactive approach to all smokers, but then targeted help to those who requested it. Although our study did not show a significant effect of the intervention on smoking cessation in the whole study population, there was *post hoc* evidence of a greater effect in the subgroup who requested help or advice from the smoking cessation adviser, with validated smoking status increased twofold in the intervention compared to the control group (adjusted OR 2.05, 95% CI 1.11, 3.76). This suggests that, while a proactive approach to smokers in general may have no more than a small and limited impact on cessation rates in the smoking population, an intervention which targets successfully smokers who want help to quit, with proactive provision of evidence-based smoking cessation support to these individuals, may be more effective.

The two previous UK studies which have adopted the approach of identifying and recruiting smokers from primary care [19,22] have found few or no significant effects of a range of proactive interventions offered to smokers. However, none of these interventions referred smokers specifically to NHS stop smoking services, which at the time were still in an early stage of development. While a US study found that smokers were much more likely to attend a smoking cessation programme if they had first received detailed information about the programme and strong encouragement to attend, the study did not report smoking cessation rates, so the effect of contacting the service on cessation is unknown [8]. Our trial is the first to assess whether proactive contacting and referral into evidence-based cessation services [11,23] would not only encourage more smokers to use the service but also lead to increased cessation. Our findings suggest that a proactive approach is successful in smokers who want help to quit, but is not an effective means of increasing cessation in the population.

In conclusion, it appears that a proactive approach is successful in reaching smokers who want support to quit through primary care, and providing information about and referral to NHS SSS appears to increase smokers' receipt of smoking cessation interventions, their propensity to start quit attempts and their chances of quitting, but this approach translates into, at best, only a modest and in our case non-significant increase in smoking cessation in the population.

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