Effectiveness of training health professionals to provide smoking cessation interventions: systematic review of randomised controlled trials

Christopher Silagy, Tim Lancaster, Stephen Gray, Godfrey Fowler

Abstract

Objective—To assess the effectiveness of interventions that train healthcare professionals in methods for improving the quality of care delivered to patients who smoke.

Design—Systematic literature review.

Setting—Primary care medical and dental practices in the United States and Canada. Patients were recruited opportunistically.

Subjects—878 healthcare professionals and 11 228 patients who smoked and were identified in eight randomised controlled trials. In each of these trials healthcare professionals received formal training in smoking cessation, and their performance was compared with that of a control group.

Main measures—Point prevalence rates of abstinence from smoking at six or 12 months in patients who were smokers at baseline. Rates of performance of tasks of smoking cessation by healthcare professionals, including offering counselling, setting dates to stop smoking, giving follow up appointments, distributing self help materials, and recommending nicotine gum.

Methods—Trials were identified by multiple methods. Data were abstracted according to predetermined criteria by two observers. When possible, meta-analysis was performed using a fixed effects model and the results were subjected to sensitivity analysis.

Results—Healthcare professionals who had received training were significantly more likely to perform tasks of smoking cessation than untrained controls. There was a modest increase in the odds of stopping smoking for smokers attending health professionals who had received training compared with patients attending control practitioners (odds ratio 1.35(95% confidence interval 1.09 to 1.68)). This result was not robust to sensitivity analysis. The effects of training were increased if prompts and reminders were used. There was no definite benefit found for more intensive forms of counselling compared with minimal contact strategies.

Conclusions—Training health professionals to provide smoking cessation interventions had a measurable impact on professional performance. A modest, but non-robust, effect on patient outcome was

also found, suggesting that training alone is unlikely to be an effective strategy for improving quality of care, unless organisational and other factors are also considered.

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Introduction

Decreasing the prevalence of smoking is a public health priority in most Western societies,¹ although there is considerable debate about the methods by which this is best achieved.² Population strategies, including legislation to prevent tobacco advertising, higher taxation, and restriction of smoking in public areas all have an important role. However, healthcare professionals are also in a position to contribute to achieving national targets for reducing smoking in the population.

There is substantial evidence that the advice and support given to smokers by healthcare professionals in primary care settings can achieve abstinence rates of between 5% and 10% with minimal intervention programmes and between 15% and 30% with more intense interventions.³ Although many clinicians will find these rates low, they could translate into a substantial public health benefit if consistently provided, as approximately 80% of adults have contact with a healthcare practitioner, usually in primary care, at least once each year.⁴ It is disappointing, therefore, that the number of patients who report receiving advice on how to stop smoking from health professionals is low.^{4,5} Increasing the amount and quality of interventions from primary care health professionals is frequently cited as a way of realising this potential health gain.⁶ Providing training in smoking cessation is one possible method for doing this, and various courses and methods are available. However, whereas individual studies have shown that training affects doctors' activities, there has been doubt about the extent to which this translates into changes in patients' behaviour.⁷⁻⁹

We addressed this issue by systematically identifying and quantitatively reviewing the evidence from randomised controlled trials that have studied the effects of training healthcare professionals to provide advice about smoking cessation and supporting them in doing so. We hypothesised (a) that training healthcare professionals is more effective than no training in increasing the number of smokers who are offered advice about stopping

Flinders University of South Australia School of Medicine, Adelaide, Australia
Christopher Silagy, professor of general practice

Imperial Cancer Research Fund General Practice Research Group, University Department of Public Health and Primary Care, Radcliffe Infirmary, Gibson Building, Oxford OX2 6HE
Tim Lancaster, deputy director
Stephen Gray, research officer
Godfrey Fowler, honorary director and reader in general practice

Correspondence to:
Dr Lancaster

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and who subsequently achieve abstinence and (b) that the effect of training can be enhanced by either providing prompts and reminders to healthcare professionals to offer advice about smoking cessation to their patients or encouraging them to offer nicotine replacement therapy as an adjunct to their advice to smokers.

Methods

We conducted a computerised literature search using the Datastar system on seven electronic databases to identify trials of smoking cessation that had been published before August 1993. The terms used in the search strategy (which varied slightly depending on the particular database) were (a) *smoking* and (b) *smoking cessation* in combination with *randomized controlled trial* or *prospective* or *random allocation* or *double blind method*. We also examined published reviews, reference lists from clinical trials, conference abstracts, smoking and health bulletins, and the bibliography on smoking and health. To identify unpublished studies, letters were sent to all investigators who had previously published a trial of smoking cessation.

We inspected each of the trials identified by these methods to find those that addressed the effectiveness of training healthcare professionals in promoting smoking cessation. To be included in the meta-analysis studies had to have allocated healthcare professionals to at least two groups by a formal randomisation process. Studies that used historical controls were excluded.

We considered two types of patient outcome measure. The first were process variables, which included the number of smokers who were counselled, asked to set a date for stopping (quit date), given a follow up appointment, given self help materials, offered nicotine gum, or prescribed a quit date. The second were rates of abstinence from smoking. We included the second outcome measure only if the abstinence rates provided were six months or more since the start of the intervention. The strictest available criteria to define abstinence were used. In studies where biochemical validation of cessation was available, only those subjects who met the criteria for biochemically confirmed abstinence were regarded as being abstinent. Point prevalence abstinence rates were taken as the primary outcome. Participants lost to follow up were regarded as being continuing smokers.

Data were extracted from the published reports by two people independently (CS, SG). Disagreements were resolved by referral to another person. No attempt was made to blind any of these people either to the results of the primary studies or to the intervention the subjects received.

The methodological quality of the studies included in the review was assessed by the simplified scheme described by Chalmers *et al.*¹⁰ Briefly, this scores three facets of trial methods that are potential sources of bias. These are (a) the quality of the random allocation (that is, control of selection bias at

entry); (b) the extent to which the primary analysis included every person entered into the randomised cohorts (that is, control of selection bias after entry); and (c) the extent to which those assessing outcome were unaware of the group assignment of the individuals being examined (that is, control of bias in assessing outcome). For each of the three facets we used a three point rating scale (a score of 3 meant that the effort to control potential bias had been maximal and a score of 1 that there had been little or no attempt to control potential bias).

The statistical methods used to pool the data entailed calculating the typical odds ratio and its confidence interval based on a fixed effects model as described by Yusuf *et al.*¹¹ Before combining results, we tested for heterogeneity.¹² Sensitivity analyses were performed to assess the robustness of the pooled results and to explore heterogeneity when this was detected. In examining the effects of training, results are expressed as odds ratios (training: no training) with 95% confidence intervals. In some trials training was compared not only with non-intervention controls, but also with another non-training intervention. For example, in one trial trained physicians were compared with a normal care control group and with a non-trained group who were asked to offer nicotine gum.¹³ Provided that there were no significant differences in outcome between the non-training interventions, they were pooled to act as the control group in the comparison with the effects of training. To examine the incremental effects of prompts and of nicotine gum we considered trials in which the effects of these strategies combined with training were compared with training alone.

Results

DESCRIPTION OF TRIALS

A total of 12 published trial reports^{7-9 13-21} were considered for inclusion in the review. Of these, two were excluded because the relevant results from the trials they described were available in the other references.^{20 21} Two more were excluded because they did not meet our inclusion criteria. One study, which compared academic detailing, courier delivery, and direct mailing of a new smoking cessation programme designed for use in primary care, did not include any measure of the extent to which physicians changed their counselling or the number of smokers who stopped smoking in the three groups.¹⁴ The other was a study of training residents in obstetrics and family practice to give advice about stopping smoking during prenatal care, but training was not the variable that was randomised.¹⁵ Table 1 shows the characteristics of the eight trials which met our inclusion criteria, including our ratings of the quality of their methods.

In seven of the eight studies included the healthcare practitioner was the principal unit of randomisation.^{7 9 13 16 17 19 20} In the remaining trial physicians received training in a brief contact strategy and in more extensive patient centred counselling, and they delivered the

Table 1 Characteristics of trials reviewed

Reference	Type of physician/ setting of care	Comparison groups and content of training	Type of training	No of healthcare professionals	No of patients	Follow up (months)	Validation of point prevalence (abstinence outcome)	Control of bias at entry	Control of bias after entry	Control of bias in outcome assessment
Wilson <i>et al</i> 1988 ¹³	Canadian private family practice	1 Normal care 2 Nicotine gum and advice 3 Nicotine gum plus training (use of gum, quit dates, 1-6 follow up visits)	Tutorial (group), 4 hours	83	1933	12	Salivary cotinine/ thiocyanate	2	3	3
Cohen <i>et al</i> 1989 ¹⁷	American private primary care medical practice	1 Training (advice, quit date, follow up check) 2 Training and prompt 3 Training and nicotine gum 4 Training, prompt, and nicotine gum	Tutorial (group), 1 hour	114	1420	12	Expired carbon monoxide	2	3	3
Cohen <i>et al</i> 1989 ¹⁶	American private dental practice	1 Training (advice, quit date, follow up check) 2 Training and prompt 3 Training and nicotine gum 4 Training, prompt, and nicotine gum	Tutorial (group), 1 hour	44	1027	12	Expired carbon monoxide	2	3	3
Cummings <i>et al</i> 1989 ⁹	American primary care medical practice (health maintenance organisation)	1 Normal care 2 Training (personalised advice, quit date, one follow up visit, self help materials, nicotine gum)	Tutorial (group), 3×1 hour	81	2056	12	Expired carbon monoxide, serum cotinine	3	3	3
Cummings <i>et al</i> 1989 ⁸	American private primary care medical practice	1 Normal care 2 Training (personalised advice, quit date, one follow up visit, self help materials, nicotine gum)	Tutorial (group), 3×1 hour	44	916	12	Expired carbon monoxide, serum cotinine	3	3	3
Kottke <i>et al</i> 1989 ⁷	American private primary care medical practice	1 Normal care 2 Self help materials 3 Training (personalised advice, quit date, nicotine gum, self help materials, follow up)	Tutorial (group), 6 hours	66	1653	12	Serum cotinine	2	3	3
Ockene <i>et al</i> 1991 ¹⁸	American primary care residency training programme	1 Training (advice) 2 Training (patient centred counselling) 3 Training (counselling and nicotine gum) plus minimal or intensive follow up telephone contact	Tutorial (group), 2½ hours	196	1286	6	Self report	3	3	2
Strecher <i>et al</i> 1991 ¹⁹	American primary care residency training programme	1 Normal care 2 Training (simple advice) 3 Prompt 4 Training and prompt	Tutorial (group), 1 hour	250	937	6	Expired carbon monoxide	2	2	2

*3 = Maximal effort to control potential bias; 1 = little or no attempt to control bias.

interventions to individual patients according to a randomised schedule. No restriction was placed on the age or sex of smokers who subsequently consulted these practitioners.

Seven of the eight trials examined the effectiveness of training medical practitioners,^{7-9 13 18-20} and two were confined to junior medical staff.^{18 19} One trial examined the effectiveness of training dental practitioners.¹⁶ All of the trials were conducted in primary care settings and were directed towards opportunistic intervention. Because all the trials were conducted in North America, however, primary care encompassed a diversity of settings including community practice, hospital based clinics, and health maintenance organisations. A record of the number of physicians invited to take part in training programmes was maintained for five trials. In these, the participation rate ranged from less than 10% among private practitioners to 90% among members of a residency training programme.

In all cases the training provided was on a group basis in tutorials or workshops. The duration of training ranged from a single one hour session to a total of six hours. Several different training methods were incorporated in these sessions, including lectures, videos, role playing, and discussion. One trial

evaluated intensive patient centred counselling,¹⁸ while the rest emphasised minimal contact strategies. The importance of setting quit dates and offering follow up was emphasised in most trials. In only one, however, was a specific follow up schedule (up to six appointments) recommended.¹³ Instruction on the use of nicotine gum was part of the training in four trials, and three trials examined its specific interaction with different forms of training.

All trials reported abstinence as the principal patient outcome. In two trials this was after six months of follow up; in the remainder it was after 12 months. Although some trials reported rates for sustained abstinence of more than three months, only the final estimate of point prevalence was supported by biochemical validation.

Five of the trials examined the effect of training on process variables in comparison with untrained control groups.^{7-9 13 19} In two trials all healthcare professionals received training, and the randomisation examined the effect of using prompts and nicotine gum, separately and combined, as enhancements to training.^{16 17} Another trial also did not include an untrained control group, reporting comparisons between different intensities of counselling.¹⁸

Effect of training on abstinence rates

METHODOLOGICAL QUALITY

The trials generally achieved good quality scores. All the trials scored highly on control of bias after entry because they included patients lost to follow up in their analysis of efficacy, assuming them to be continuing smokers. Seven of the eight trials controlled for bias in outcome assessment by biochemically validating self reports of abstinence. Most variation occurred in the control of selection bias at entry: only three trials specified the procedure used in randomisation.

EFFECT OF TRAINING ON ABSTINENCE RATES

The effects of training on abstinence rates are shown in the figure and the data are given in tables 2 and 3. Smokers offered advice by health professionals who had received training in smoking cessation methods had a significant increase in their odds of stopping compared

with smokers who attended control practitioners (odds ratio 1.35(95% confidence interval 1.09 to 1.68)). There was no significant heterogeneity detected in this analysis. The conclusion that training improves patient outcome was, however, highly sensitive to the findings of one study,¹³ and when this study was excluded the improvement in patient outcome was no longer significant (odds ratio 1.10(0.83 to 1.40)).

EFFECT OF ADJUNCTS TO TRAINING ON ABSTINENCE

The odds of quitting were increased if prompts and reminders to practitioners to use smoking cessation techniques were used in addition to a training programme (odds ratio 2.37(1.43 to 3.92)), although these data are derived from only three trials. In contrast, when nicotine gum was provided in addition to brief contact training the odds of smokers quitting also increased, but the number of subjects was too few for this to reach significance.

EFFECT OF TYPE OF COUNSELLING

One trial compared the effects of training physicians to provide patient centred counselling, with or without nicotine gum, with training in giving simple advice alone.¹⁸ When taken together, the two counselling arms resulted in six month self reported point prevalence smoking cessation rates that were significantly better than simple advice (odds ratio 1.65(1.16 to 2.34)). However, there was no significant difference in outcome when patient centred counselling without nicotine gum was compared with simple advice. Smokers who received patient centred counselling were more likely to rate their physician as having been helpful in supporting their trying to stop smoking. This trial also examined the additional impact of telephone follow up by counsellors as an adjunct to the physician intervention, finding no additional benefit from this intervention.

Table 2 Effect of providing training on smoking cessation to healthcare professionals

Reference	Training		No training		Odds ratio (95% confidence interval)
	Observed	Total	Observed	Total	
Cummings et al. ⁹	26	1024	15	1032	1.74(0.04 to 3.23)
Cummings et al. ⁸	31	470	36	496	0.90(0.55 to 1.48)
Wilson et al. ¹³	55	606	67	1327	1.98(1.33 to 2.93)
Strecher et al. ¹⁹	5	234	2	225	2.29(0.52 to 10.18)
Kottke et al. ⁷	36	660	52	993	1.04(0.67 to 1.62)
Total					1.35(1.09 to 1.62)

Test for heterogeneity: $\chi^2 = 8.52$, $df = 4$, $p > 0.10$.

Table 3 Effect of different strategies in addition to training on smoking cessation

Reference	Strategy		Control		Odds ratio (95% confidence interval)
	Observed	Total	Observed	Total	
Inclusion of prompts to healthcare professionals					
Cohen <i>et al</i> ¹⁶	6	217	9	290	0.89(0.32 to 2.51)
Cohen <i>et al</i> ¹⁷	28	353	5	338	4.12(2.05 to 8.30)
Strecher <i>et al</i> ¹⁹	10	250	5	234	1.86(0.66 to 5.19)
Total					2.37(1.43 to 3.92)
Test for heterogeneity $\chi^2 = 6.06$, df = 2, p < 0.05.					
Provision of nicotine gum					
Cohen <i>et al</i> ¹⁶	31	520	15	507	2.02(1.12 to 3.64)
Cohen <i>et al</i> ¹⁷	36	729	33	692	1.04(0.64 to 1.68)
Total					1.35(0.93 to 1.97)
Test for heterogeneity: $\chi^2 = 1.68$, df = 1, p > 0.02.					

Test for heterogeneity: $\chi^2 = 1.68$, $df = 1$, $p > 0.02$.

EFFECTS OF TRAINING ON PROCESS VARIABLES

Table 4 shows the effect of training on professional activities. There was a clear increase in the odds of receiving some form of counselling, being set or prescribed a quit date, having a follow up appointment suggested, and receiving self help materials or nicotine gum if the smoker attended a healthcare professional who had received training in smoking cessation. There was significant statistical heterogeneity detected in these analyses, so the pooled odds ratios must be interpreted with caution. Sensitivity analysis indicated that most of the heterogeneity was attributable to one study,¹³ which reported strongly positive effects from training. When we removed this study from the analysis, however, the direction of the effect did not change, only its size. For example, the odds ratio for the effect of training on the number of patients counselled dropped from 1.44(1.29 to 1.60) to 1.41(1.26 to 1.58) when this study was excluded. The conclusion that training improves the performance of physician activities is therefore robust.

Discussion

Programmes designed to train health professionals to provide smoking cessation intervention are clearly effective in increasing a number of intermediate outcomes, including the number of patients who receive counselling, set a quit date, and are given follow up appointments, self help materials, and nicotine gum.

The more important issue is how effective they are in stopping patients smoking. Our pooled results suggest that there is a modest, but significant, effect on this outcome. This result depends heavily, however, on the results of one trial, which also reported more favourable effects on process than any other study.¹³ This discrepancy is unlikely to be the result of methodological weaknesses as this study achieved high quality ratings by our scoring system. A more likely explanation is the nature of the intervention. The training in this study emphasised the importance of follow up to a far greater degree than any of the other programmes studied. Physicians were trained to challenge the patient at a first appointment, to schedule a separate appointment to set a quit date, and to offer up to four supportive

follow up visits. Moreover, the physicians were paid per item for each of these follow up visits according to the standard reimbursement scheme in the Canadian healthcare system. Although in most of the trials some form of follow up was recommended as part of the training, in none of the others was a specific schedule arranged, and few such visits were scheduled. This may be related to the fact that reimbursement for such visits is generally not forthcoming from third party payers in the United States, where all the remaining studies took place. The implication of these findings is that training alone is unlikely to represent a useful investment of resources, unless it is linked to organisational changes that facilitate the intervention. This is consistent with a recent review of 50 randomised controlled trials covering a wide range of subjects and types of intervention.²² The review found that educational strategies that helped practice and were reinforced by follow up and reminders were major determinants of successful continuing medical education.²²

This conclusion is particularly relevant in considering the generalisability of these results to primary care within the British national health service. Preventive activities must compete with other pressing demands on general practitioners. Intensive strategies that entail multiple follow up visits may make unrealistic demands on limited clinical time. Team approaches, in which the tasks of smoking cessation are shared between different health professionals (general practitioners and practice nurses, for example), is one possible solution to this problem.²³ Our results show that adjuncts such as manual or computerised reminders to provide advice on smoking are effective and should form part of such strategies. Similarly, although we were unable to show a conclusive benefit from adding nicotine gum to training, it is clear from other work that nicotine replacement can improve the chances of stopping smoking in some patients²⁴ and should play an integral part in smoking cessation programmes in primary care.

The studies we reviewed give limited information about the relative efficacy of different approaches to counselling smokers. Behavioural scientists often argue that simple advice alone is ineffective in promoting sufficient change in behaviour, and more intensive training in counselling methods, such as motivational interviewing,²⁵ might lead to higher success rates. However, in the one trial that compared provision of advice by trained physicians with provision of patient centred counselling, also by trained physicians, there was no significant difference in the self reported quit rates at six months, unless nicotine gum was included with counselling.¹⁸ Caution is required in interpreting this finding as it was derived from only one trial, which had limited power to detect a small effect, and further research is needed.

A further reason why the effects of training seen in this review seems to be limited is that the use of "quitting" as a patient based outcome may be inappropriate for this type of

Table 4 Effect of providing training on smoking cessation to healthcare professionals

Reference	Training		No training		Odds ratio (95% confidence interval)
	Observed	Total	Observed	Total	
On No of patients counselled					
Wilson <i>et al</i> ¹³	82	96	94	184	4.33(2.60 to 7.21)
Cummings <i>et al</i> ⁹	471	1024	423	1032	1.23(1.03 to 1.46)
Cummings <i>et al</i> ⁸	265	470	181	446	1.88(1.45 to 2.44)
Kottke <i>et al</i> ⁷	358	660	485	993	1.24(1.02 to 1.51)
Strecher <i>et al</i> ¹⁹	183	234	155	225	1.61(1.07 to 2.44)
Total					1.44(1.29 to 1.60)
Test for heterogeneity: $\chi^2 = 27.75$, df = 4, p = <0.001.					
On asking smoker to set a quit date					
Wilson <i>et al</i> ¹³	52	96	13	184	13.91(7.76 to 24.94)
Cummings <i>et al</i> ⁹	100	470	22	446	4.11(2.81 to 6.02)
Cummings <i>et al</i> ⁸	385	1024	115	1036	4.22(3.45 to 5.17)
Kottke <i>et al</i> ⁷	358	660	485	993	1.24(1.02 to 1.51)
Strecher <i>et al</i> ¹⁹	21	234	14	225	1.48(0.74 to 2.94)
Total					2.59(2.28 to 2.94)
Test for heterogeneity: $\chi^2 = 116.40$, df = 4, p = <0.001.					
On making a follow up appointment					
Wilson <i>et al</i> ¹³	80	96	25	184	19.40(11.66 to 32.27)
Cummings <i>et al</i> ⁹	50	470	19	446	2.50(1.53 to 4.08)
Cummings <i>et al</i> ⁸	156	1024	52	1036	3.08(2.31 to 4.10)
Kottke <i>et al</i> ⁷	68	660	56	993	1.96(1.35 to 2.84)
Strecher <i>et al</i> ¹⁹	128	250	124	234	0.93(0.65 to 1.33)
Total					2.57(2.17 to 3.04)
Test for heterogeneity: $\chi^2 = 95.34$, df = 4, p = <0.001.					
On handing out self help materials					
Wilson <i>et al</i> ¹³	77	96	18	184	5.30(2.01 to 13.99)
Cummings <i>et al</i> ⁹	151	470	38	446	4.22(3.06 to 5.81)
Kottke <i>et al</i> ⁷	224	660	258	993	1.47(1.18 to 1.82)
Strecher <i>et al</i> ¹⁹	23	234	29	225	0.74(0.41 to 1.31)
Total					2.39(2.03 to 2.81)
Test for heterogeneity: $\chi^2 = 119.92$, df = 3, p = <0.001.					
On offering smokers nicotine gum					
Wilson <i>et al</i> ¹³	60	96	63	184	8.95(4.88 to 16.43)
Cummings <i>et al</i> ⁹	104	1024	108	1036	0.97(0.73 to 1.29)
Cummings <i>et al</i> ⁸	34	470	34	446	0.94(0.58 to 1.55)
Strecher <i>et al</i> ¹⁹	40	234	29	225	1.39(0.83 to 2.32)
Total					1.24(1.02 to 1.52)
Test for heterogeneity: $\chi^2 = 17.63$, df = 3, p = <0.001.					
On prescribing a quit date					
Cummings <i>et al</i> ⁹	165	1024	12	1036	6.71(4.93 to 9.13)
Cummings <i>et al</i> ⁸	44	470	2	446	6.47(3.57 to 11.70)
Strecher <i>et al</i> ¹⁹	14	234	5	225	2.57(1.03 to 6.45)
Total					6.16(4.74 to 8.00)
Test for heterogeneity: $\chi^2 = 3.79$, df = 2, p = 0.15.					

study. Support for this stems from recent theories of how patients change their smoking behaviour. Prochaska and DiClemente have proposed a model of different "stages of readiness" leading to behavioural change.²⁶ In this model, smoking cessation is seen as a process with several discrete stages of readiness to change. It would be unrealistic to expect someone who is at a "pre-contemplative phase" to stop smoking within a short period of time as a result of contact with a physician. A more appropriate patient based outcome measure might be whether the intervention helps such a person to move to the next stage, where they are ready to "contemplate" stopping. None of the trials we studied considered this outcome. Simple rating scales that assess readiness to change now exist,²⁷ and it will be important to examine their utility as outcome measures in future trials of smoking cessation.

Several methodological limitations of this meta-analysis need to be borne in mind. The analysis was based on tabulated data available in published reports rather than data on individual patients, which may lead to problems associated with publication bias, exclusion of patients, and length of follow up of patients.²⁸ In addition, all but one of the studies related to training physicians. In the future, studies are needed which examine the effectiveness of training other types of healthcare professional who may also be in a position to provide counselling about stopping smoking. Nurses, pharmacists, and physiotherapists are all well placed to facilitate smoking cessation. In addition, given the importance we have attached in our conclusions to organisational and fiscal factors in supporting training interventions, training programmes which take specific account of the circumstances of the setting of care, such as British general practice, require evaluation. Training can be expensive, and simply providing programmes for healthcare professionals, without addressing the constraints imposed by the conditions in which they practise, is unlikely to be a wise use of healthcare resources.

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