

Determinants of outcome in smoking cessation

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SUMMARY. A large amount of research has been conducted into the factors which influence outcome in attempts to stop smoking. This article reviews the literature in two main areas: first, the effects of patient characteristics on outcome, and secondly, the effectiveness of various primary care interventions. The practical implications of this research for primary care interventions to help people stop smoking are explored.

Keywords: smoking cessation; literature review.

Introduction

CIGARETTE smoking continues to be a major cause of illness and premature death worldwide.¹ Tobacco consumption in the western world has declined over the last 20 years, but almost one third of the adult population of the United Kingdom still smokes.² The fact that over 80% of smokers have made at least one attempt to stop smoking³ indicates both the widespread acceptance of the harmful effects of smoking and the difficulty of giving up.

It is therefore understandable that a vast amount of research into smoking cessation has been carried out over the last two decades. As smoking receives renewed attention in the current health promotion boom, it is perhaps timely to review the findings of this research and to assess the implications for smoking cessation in primary care.

Models of smoking behaviour

There has been much debate over the relative roles of psychological and pharmacological factors in the initiation and maintenance of smoking. According to social learning theory⁴ specific behaviours are learned from the observation of the behaviour of others, reinforced by rewards or punishments for one's own behaviour. There is evidence that social forces, for example peer group pressure, are important in the initiation of smoking.^{5,6} While such forces may continue to influence the maintenance of smoking behaviour, other, more internal, factors also come into play. Several classifications of motives for smoking, based on factor analysis of self-reported information, have arrived at similar sets of motives. Ikard and colleagues⁷ identified six factors — habit, addiction, pleasure, stimulation, sensorimotor manipulation and reduction of negative affect — which have been validated by later studies.^{8,9} Russell and colleagues¹⁰ identified six types of smoking — automatic, addictive, indulgent, stimulating, sensorimotor, and psychological — and they also identified a 'pharmacological addiction' dimension which encompassed the stimulating, automatic and addictive types of smoking, all three of which were shown to correlate with cigarette consumption, in contrast to the other types of smoking. Their model suggests a progression from psychological initiation to sensorimotor smoking to smoking for pharmacological effect. However, this progression to addic-

tive smoking does not appear in all smokers, and tends to appear early if at all.

Other work has suggested that smoking can be used to control mood and cope with stress.^{11,12} Ockene's model views smoking as a maladaptive behaviour used to cope with stress in the absence of appropriate psychological coping abilities.¹³

It would appear that reasons for smoking are many and varied. Individuals have different motives, which may well change throughout the individual's smoking career.

Patient factors associated with successful smoking cessation

Many studies have attempted to identify factors predicting success in stopping smoking. Results have often been conflicting, largely owing to the wide range of methodological approaches adopted and to the widely different criteria adopted to measure success in smoking cessation. Retrospective studies are subject to distortions of memory and the effects of rationalization, while prospective studies may influence the behaviour under study and are subject to unreliable self-reporting of smoking status, particularly if no validation measures are used.

Most prospective studies use populations from smoking cessation clinics, and the particular methods used in the programme may confound the effects of the individual characteristics being investigated. Variations in study populations, outcome criteria, operationalization of the factors under study and statistical techniques all contribute to the difficulty of interpreting and comparing results. However, it is possible to draw some general conclusions where several studies, albeit using different methodologies, have produced similar results.

Demography

Age. Several studies show no effect of age on outcome of cessation attempts.¹⁴⁻¹⁷ Most other studies indicate that the chances of success in any one attempt decrease as age increases.¹⁸⁻²¹ However, the proportion of ex-smokers to smokers increases with age, mainly owing to an increase in the total number of attempts with age,²² although the increased mortality of smokers would also make a contribution.

Sex. Women generally find it more difficult to give up smoking than men.^{19,21-24} Dependence on cigarettes has been shown to have a greater adverse effect on outcome in women than in men.^{16,25} Women are more likely to cut down consumption rather than stop completely,²⁶ a strategy known to have little success.²⁷ Women have been shown to be more likely than men to smoke for reduction of negative affect and pleasure, which is postulated to be due to the greater degree of stress which women experience.⁹ Women may also have less confidence in being able to stop smoking,^{28,29} a factor which has been shown in other studies to predict poor outcome.^{19,30-35}

Socioeconomic factors. Most studies which have examined socioeconomic factors have, perhaps unexpectedly, found no association with outcome.^{16,17,19,20,36} Barnes and colleagues³⁷ found that wealthier people were more successful in stopping, while higher levels of education were associated with success in a few studies, notably those which had gone outwith cessation programmes for their subjects.^{24,38}

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Smoking history. To quantify cigarette consumption, some studies have used statistics on continuous variables while others have used categorical groupings of consumption. The evidence is conclusive that heavier smokers find it more difficult to stop.^{18,21,30,31,34,36,39} This relationship holds even when other variables are controlled for,⁴⁰ lending support to the theory that there is a major addictive component to heavy smoking which makes giving up more difficult. Various measures of nicotine addiction have been devised and validated, notably Fagerstrom's eight point tolerance questionnaire;⁴¹ however, a valid measure of addiction can be simply obtained from the number of cigarettes smoked per day and the time from waking to the first cigarette of the day.⁴² Several studies also demonstrate that chances of success in any one cessation attempt decrease with the length of time spent as a smoker.^{34,38,43}

Personal factors

This is one area where a plethora of theoretical models and research instruments makes comparison between studies particularly difficult. Research has tended to focus on attributes with face validity as potential determinants of successful cessation, the main examples of which are discussed here.

Belief in personal control. Ockene and colleagues^{13,17} identified a cluster of cognitive attributes which contribute to belief in personal control of one's life, as opposed to control by fate, powerful others or other external factors. These attributes (namely internal locus of control,⁴⁴ a high expectation of success and positive previous cessation experiences) were associated with better outcome, particularly an increase in initial cessation rates. Other research into locus of control theory has produced conflicting evidence regarding the hypothesis that people who are internal controllers do better than external controllers.⁴⁵⁻⁴⁸ Greater expectation of success and higher ratings in Bandura's related concept of self-efficacy,⁴ have been associated with better outcome in several studies.^{19,30-34,49} Curry and colleagues found that expectation of success influenced short term but not long term outcome.¹⁴ A greater degree of success, for example, longer period of abstinence, in previous cessation attempts increases the chance of success in subsequent attempts.^{14,16,17,34,37}

Health beliefs and attitudes. Beliefs and attitudes regarding the effects of smoking on health have long been assumed to be an important determinant of smoking behaviour and much health promotion activity has been directed towards trying to change these. However, the evidence for the effect of health beliefs on behaviour is conflicting. Pederson and colleagues' study³⁰ of patients with respiratory disease showed that beliefs regarding smoking and health did not influence smoking behaviour. Richmond and colleagues³⁹ reached the same conclusion in a study of general practice intervention.

Conversely, Marsh and Matheson's elegant study of attitudinal change,³ based on Fishbein and Ajzen's theory of reasoned action,⁵⁰ demonstrated that a change in beliefs and attitudes regarding the health consequences of giving up smoking preceded the intention to change smoking behaviour, which in turn preceded actual change in behaviour. An Australian study found that health beliefs on their own did not predict intention to stop smoking, but that there was an interaction between health beliefs and social influence in predicting intention.⁵¹ Belief in personal vulnerability to smoking-related disease was shown to predict participation, but not outcome, in a stop-smoking programme.³⁶

Motives for smoking and smoking cessation. The evidence suggests that those who smoke for reasons of addiction and habit are less likely to stop smoking.^{31,34,37} This accords with the find-

ings associating higher consumption with poorer outcome. No other category of smoking motive was found to have any predictive value in the above studies. Smoking for reduction of negative affect was found to be associated with higher relapse rates in one study.⁵²

Surprisingly few studies have examined the relationship between motives for stopping and outcome. Eisinger showed that stopping for financial reasons predicted a poor outcome, and that stopping because of a desire to improve one's health, or because the health of a relative had suffered from smoking, predicted a good outcome.^{19,31} A retrospective study found that the motive for stopping had no effect on outcome.²⁰ Various measures of the strength of desire or motivation to stop smoking have been shown to correlate positively with success, again mainly in initial or short term cessation.^{14,16,21,30}

Stress. Stress has been shown to be adversely associated with both short term and long term cessation.¹⁷ Factor analysis of several psychological variables in a study of men within the multiple risk factor intervention trial programme revealed a stress factor, with components of anxiety, depression, higher frequency of life events, and lower personal security, which was associated with less long term success in stopping smoking.⁵³ Curry and colleagues¹⁴ found that lower stress levels predicted long term abstinence but not initial cessation, while Glasgow's team¹⁵ found a lower degree of perceived stress to be the only factor predictive of success in a month-long stop-smoking contest. Other studies investigating the mechanisms of relapse have confirmed the role of stress in reducing the prospect of long term success.^{25,54}

Coping skills. Recent research into cessation has increasingly focused on the phenomenon of relapse, and the role of coping skills, both cognitive and behavioural, in preventing relapse. The use of multiple coping skills was found to be associated with long term abstinence in a study of unaided cessation.²¹ Stevens and Hollis⁴³ demonstrated a significant improvement in long term abstinence rates in those receiving a short, intensive course of skills training.

Schiffman found that the use of either cognitive or behavioural skills in a relapse crisis doubled the chances of surviving that crisis, while using both types of skills improved prospects further.⁵⁴ Similar results were obtained by Bliss and colleagues,⁵⁵ who found that it was the number, and not the type, of coping strategies used which determined outcome. However, Wewers⁵⁶ found that problem-focused coping responses (analogous to behavioural strategies), were more likely to be successful than emotion-focused responses (analogous to cognitive strategies).

In contrast, a recent prospective study has shown that the successful use of coping skills in any one relapse crisis does not predict long term abstinence, and that frequent exposure to high risk situations may eventually overcome initially successful coping abilities.³⁴

Social factors

Social support. Several studies have shown that the support of significant others enhances outcome. Mermelstein and colleagues found better outcome in subjects whose partners participated in their attempt in a reinforcing or encouraging, rather than a policing or nagging, role.⁵⁷ However, they found that high levels of partner support increased success in initial cessation and short term maintenance but did not influence long term abstinence.⁵⁸ Further evidence for the part played by partner support in initial cessation comes from Ockene.¹⁷ Marriage has been shown to be a predictor of good outcome in several studies,^{30,38,43} which may relate, at least partly, to its potential as a source of support.

Relapse situations and smoking status of social contacts. Almost all research on this subject has found an adverse relationship between outcome and the number of smokers in the environment.^{14,19,21,36,43} The tendency for successful abstainers to change their social circle to include more non-smokers can be interpreted as either cause or effect of their success.⁵⁹

The social milieu influences outcome since situations may arise where the pressure to resume smoking is particularly strong. A study of the attitudes of Glaswegian men showed that the prevalent social pressures against the acceptability of smoking were reversed in the public house.⁶⁰ Other work confirms the role of alcohol consumption in relapse,^{54,61} Cummings and colleagues found that over 20% of all relapses occurred while subjects were drinking alcohol. Consumption of food and coffee has also been found to precede a large proportion of relapse crises.^{54,62}

A specific crisis in the ex-smoker's social situation was given as a reason for relapse by over half of respondents who had relapsed in Cummings and colleagues' study.⁶² Family crises, such as an argument with a spouse, or work-related crises, such as pressure to meet a deadline, accounted for most of these situations.

Biological factors

Withdrawal symptoms. Given the conclusive evidence linking a high number of cigarettes smoked per day to poor outcome of smoking cessation, one might expect that there would also be an association between the severity of withdrawal symptoms and outcome. In fact, few authors have looked at this question. Garvey's team²⁰ found irritability to be the only withdrawal symptom to correlate significantly with outcome, while several studies have shown a relationship between higher overall levels of withdrawal symptoms and poorer outcome.⁶²⁻⁶⁴ Shiffman found that only half of ex-smokers undergoing a relapse crisis in the weeks following cessation experienced any withdrawal symptoms during the crisis, with further analysis indicating that withdrawal symptoms were seldom the immediate precipitants of a relapse crisis.⁵⁴ However, Cummings found that people who relapsed within one week of stopping smoking were more likely than those who relapsed later to attribute their relapse to withdrawal symptoms. The people who relapsed early after giving up smoking were also more likely to be heavy smokers and to report frequent cravings for a cigarette.⁶²

It appears that in spite of the predominance which withdrawal symptoms enjoy in smoking cessation folklore, their role is uncertain; they may well be important to the success or failure of the heavier smoker but largely irrelevant to lighter smokers.

Weight gain. Anecdotal evidence of weight gain by many smokers who stop is confirmed by Hall and colleagues,⁶⁵ who found that weight gain was greater for smokers who were heavier in terms both of cigarette consumption and of body weight prior to stopping. A belief that stopping smoking would lead to weight gain was shown to predict poorer outcome in a worksite cessation programme, but did not affect participation.³⁶ A community study found that concern over weight control was the major factor associated with smokers who had never tried to give up smoking.⁶⁶ Richmond and colleagues demonstrated that concern about weight gain predicted poor short term outcome.³⁹

Models of change in smoking behaviour

Many authors have tried to integrate the results of research into smoking-specific behaviour with general theories of behavioural change in order to produce models of the process of stopping smoking.

Ockene¹³ developed a psychosocial model which views smoking as a means of dealing with stress, and smoking cessation as being determined by the balance of stress versus the presence of personal and social resources for coping with stress. Smoking cessation is a multi-stage process, with different factors important for success at different stages. Other workers have arrived at similar conclusions^{14,21,39} and three stages in cessation are proposed: initial cessation, short term maintenance and long term maintenance/relapse prevention. Unfortunately there is little consensus as to which factors are important in each stage.

Prochaska and DiClemente proposed a five-stage model of behavioural change — precontemplation, contemplation, action, maintenance and relapse.⁶⁷ Each stage is characterized by the differential use of certain processes of change, for example predominantly consciousness raising and self re-evaluation in the contemplation stage and stimulus control and counter-conditioning in the maintenance stage. Individuals may go through the five-stage cycle several times in the course of their smoking career. The necessity of antecedents to changes in actual behaviour is also recognized in Fishbein and Ajzens' theory of behavioural change,⁵⁰ in which changes in beliefs and attitudes are the precursors of behavioural change; there is evidence in support of this theory with respect to smoking.³

Intervention studies

Comparisons of success rates between trials are difficult to interpret because of methodological differences. In particular, studies using the more stringent, and more meaningful, outcome criterion of continuous abstinence record far lower success rates than those using point abstinence. The comparisons of treatment and control groups within individual trials is therefore generally more useful than between-trial comparisons.

A selected summary of patient characteristics, their association with better outcome in smoking cessation and possible interventions by health professionals related to the characteristics, is shown in Table 1.

A recent extensive review by Schwartz⁶⁸ calculated a median success rate of 36% after one year for cessation clinics, with no consistent differences in success rates among the various methods used. For primary care interventions, Schwartz calculated a median success rate of 6% after one year for 12 different interventions which consisted of advice only, compared with 23% for 10 studies where interventions consisted of advice plus other components. However, not all of the 10 studies were on unselected primary care populations, and 23% may be, therefore, artificially high. The higher success rates of smoking cessation clinics reflects the fact that clinic attenders are a self-selected population, motivated to stop smoking. It may also reflect the greater experience and expertise of clinic staff and the fact that clinic interventions are generally more intensive.

However, this is not to undervalue the potential effect of general practice interventions. Russell and colleagues' seminal paper showed that opportunistic minimal intervention produced a one year continuous abstinence rate of up to 5%, depending on the level of the intervention, compared with 0.3% in a control group.⁶⁹ He estimated that such an approach, if adopted by all general practitioners in the UK, could help up to half a million people give up smoking each year.

Raising the subject of stopping smoking, together with brief advice on how to go about it, produced continuous abstinence rates at one year of up to 3% in an unselected population of smokers.^{69,70} The addition of a further component, such as a leaflet or informing the patient that he/she will be followed up, may produce a further rise in the success rate of up to 2%.^{69,71} Other additional inputs shown to improve outcome in smoking cessation include oximeter demonstration of exhaled carbon

Table 1. Effects of selected patient characteristics on attempts at stopping smoking and possible interventions.

Characteristics	Association with better outcome	Interventions by health professionals
<i>Addiction</i>		
Daily cigarette consumption	Lower consumption	Encourage to cut down 'non-essential' cigarettes before date for stopping completely; a smoking diary may be useful
Cigarette withdrawal symptoms	Fewer symptoms	Consider use of nicotine chewing gum, particularly for heavier smokers
<i>Personal factors</i>		
Self-efficacy, expectation of success, confidence	Higher levels	Give encouragement; promote self-esteem; build on any previous success
Appreciation of health risks	Better appreciation	Emphasize health consequences of stopping/continuing smoking; consider use of oximeter or flow meter
Desire to stop smoking	More desire	Reinforce benefits of stopping and risks of not stopping
Motives for stopping smoking	Health motive; finance not sole motive	Find out reasons for stopping and reinforce with additional ones, particularly if finance is the only motive offered
Stress	Less stress	Examination of lifestyle; counselling; relaxation techniques
Coping skills	Better skills	Anticipate relapse situations and plan behavioural or cognitive responses in advance: leaflets may be useful
<i>Social factors</i>		
Social support	More support	Encourage to involve others: asking partner to stop, telling friends and workmates and asking for their support
Smoking status of contacts	Fewer smokers	Encourage to avoid company of other smokers as far as possible
Relapse situations	Less contact with 'high risk' situations	Advise to anticipate and avoid high-risk situations where possible, and teach use of coping skills
<i>Biological factors</i>		
Weight gain	Less concern over weight gain	Advise choice of oral substitutes, temporary nature of weight gain, benefits of exercise, balance of health risks of smoking and weight gain

monoxide (success rate 17% in study group versus 11% in control group),⁷² a letter and questionnaire from the general practitioner (10% versus 7%),⁷³ and support from and option of referral to a district smokers' clinic (6% versus 3%).^{70,74} An intensive programme including physiological measurements, detailed advice on how to stop smoking and frequent follow up, achieved a continuous abstinence rate at three years of 22%.⁷⁵

The effect of follow up itself is inconclusive, with some studies showing improved outcome,^{75,76} and others showing no significant effect^{77,78} or a poorer outcome.⁷⁹ This suggests that any effect is likely to be small, and given the substantially increased input of resources required, follow up may not be cost effective.⁸⁰

The use of nicotine chewing gum has been extensively researched. Most studies conclude that if used well it can substantially improve success rates in smoking cessation,^{77,78,81,82} although a placebo-controlled trial in general practice showed no advantage over placebo.⁸³ It is more effective for heavier smokers, but may be counterproductive for light smokers.⁸⁴ However, it is not a panacea and must be used as part of a wider approach; patients' expectations must be realistic, and explicit instructions on its use are essential for success.⁸¹

It has been shown that the greater the input from helping professionals, the greater the chances of success, and even minimal intervention, such as raising the issue of stopping smoking with patients, can have some effect. Minimal interventions work by increasing the number of patients who try to stop smoking, rather than by increasing the success rate of individual attempts.⁷¹ This fits well with Prochaska and DiClementes' model,⁶⁷ where consciousness-raising by bringing up the topic

of stopping smoking will help some patients move from the precontemplation or contemplation stages to the action stage of stopping smoking. Thereafter, successful outcome may be helped by additional inputs to enable patients to cope with the process of stopping.

A further aspect of primary care intervention is the health promotion smoking cessation clinic. The work of these clinics has so far not been evaluated, despite their increasing prevalence. Little research has been carried out on the role of other primary health care team workers; the few studies that have been conducted have shown disappointing results.^{85,86} Sanders and colleagues⁸⁷ found a low level of participation by practice nurses in anti-smoking education, and suggested that the main reasons for this were a lack of relevant training, nurses' lack of confidence in their own effectiveness, and the definition of the practice nurse's role as being predominantly confined to treatment room duties.

Conclusions

Smoking behaviour and smoking cessation behaviour are complex. However, research has clearly shown that certain characteristics influence an individual's chances of success in stopping smoking and that many of these characteristics can be modified so as to increase the likelihood of success.

Assessment of patients' individual characteristics would allow general practitioners to target their efforts both on patients for whom stopping smoking is likely to be particularly difficult and on patients most likely to succeed. The relative cost effectiveness of these approaches is not known. However, given the small

amount of time and effort required to raise the topic of smoking with a patient, there is little justification for denying any patient this effective minimal intervention. Further input may be judged appropriate depending on the patient's response. At this stage, the patient's specific characteristics might be elicited and suitable interventions chosen. On a practice or population basis, it would appear that any level of activity which promotes smoking cessation in primary care, from minimal intervention upwards, will have an effect, and that success is proportional to the level of input rather than to its specific content. The two exceptions to this are that the appropriate use of nicotine chewing gum has been found to be particularly effective, and that follow up has so far not been shown to be effective and may be inefficient.

Factors other than patient characteristics or intervention methods are also important and these include issues such as the motivation, attitudes, knowledge and interpersonal skills of the individual practitioner; the costs of interventions in terms of professionals' time and the related question of reimbursement; and the wider issues of fiscal and legislative policy. Initiatives in these areas may prove as valuable for reducing smoking prevalence as the advances resulting from research.

Finally, if the envisaged extended role of the primary health care team in health promotion is to be soundly based, there is a need for the evaluation of the relative effectiveness and cost effectiveness of clinic-based and opportunistic approaches to smoking cessation, and for investigation into the potential contributions of the various team members and how these may be maximized.

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