

available at www.sciencedirect.comjournal homepage: www.elsevier.com/locate/rmed

Common predictors of smoking cessation in clinical practice

Pasquale Caponnetto*, Riccardo Polosa

Centro per la prevenzione e cura del tabagismo, Department of Internal and Specialistic Medicine, University of Catania, Azienda Ospedaliera Universitaria Vittorio Emanuele - Ferrarotto - Santo Bambino, 95124 Catania, Italy

Received 23 October 2007; accepted 24 February 2008

Available online 30 June 2008

KEYWORDS

Smoking cessation;
Predictors of smoking
cessation;
Cigarette consumption

Summary

Although smoking cessation is clearly beneficial, many smokers respond poorly to smoking cessation efforts with rather disappointing overall success rate of long-term abstinence. The perceived lack of effectiveness of smoking cessation may well influence how physicians set their priorities with regard to an effective use of their consultation time. Negative beliefs and attitudes can be resolved by advancing the general understanding of the natural history of quitting, by making sensible use of smoking cessation services, and by being aware of the correct use of drugs for nicotine dependence when prescribed. In particular, a better understanding of predictors of success in smoking cessation can help physicians in identifying smokers who stand a fair chance of quitting. The purpose of the present article is to review those predictors of smoking cessation that can be of help in routine clinical consultation.

© 2008 Elsevier Ltd. All rights reserved.

Introduction

Cigarette smoking is a modern day epidemic that poses substantial health burden and costs.¹

The long-term risks of smoking have been definitely quantified in a 50-year prospective cohort study of over 34,000 male British doctors that compared the overall survival of smokers and non-smokers over time showing remarkable difference in mortality rates between smokers and non-smokers.² The American Cancer Society's second Cancer Prevention Study involving more than one million

adults found that, among males in the USA, smoking is associated with about two-thirds of all the deaths in middle age among those who smoke cigarettes regularly with a strong dose–response relationship.³ Peto et al.⁴ have recently estimated mortality from smoking in the European Union (EU). On average, smokers who die as a result of their smoking die 14 years earlier than never-smokers.

There is now abundant evidence that health risks associated with cigarette smoke can be reversed following a sufficient period of abstinence, and achieving life-long abstinence is an important public health goal for both developed and developing countries.^{5,6} Smoking cessation is an important component of tobacco-control policies and evidence-based recommendations indicate that it is beneficial to smokers. Typically, the spectrum of available smoking cessation interventions spans from simple advice

* Corresponding author. Tel.: +39 095 7435440; fax: +39 095 7435083.

E-mail address: capasqu@yahoo.it (P. Caponnetto).

to intensive behavioural support together with pharmacological treatment.⁷

The perceived lack of effectiveness of smoking cessation may well influence how physicians set their priorities with regard to an effective use of their consultation time. A recent systematic review has revealed that approximately 40% of primary care physicians felt that advising smokers about cessation is time-consuming and ineffective.⁸ Physicians' negative beliefs and attitudes can be resolved by emphasizing that valuable predictors of smoking cessation can be easily identified thus making an efficient use of their time.

Hence, identification of individual characteristics that predict success in smoking cessation efforts is highly desirable as this could help to match smokers with a strategy that is more likely to help them quit, to identify smokers who might need more intensive treatment (who would then require referral to specialist centres), and to make the most of health care resources.

In this review article, we describe predictors of smoking cessation that can be of help in routine clinical consultation. These predictors have been identified on the basis of a literature search in PubMed. The terms for the search were "*smoking cessation*" and "*predictor*". We limited our search to Titles and Abstracts of human studies published in English. The initial search resulted in 439 hits. Data on long-term (≥ 6 months) quit rates must have been presented in studies of adequate sample size for inclusion. Smoking cessation studies on specific population groups (e.g., chronic disease populations, psychiatric disorders, special ethnic groups, adolescents) were not considered for inclusion. We identified 202 relevant articles addressing predictors of smoking cessation including reviews and meta-analyses. The search repeatedly identified a number of predictors including: sex, age, age at smoking initiation, history of previous quit attempts, depression, anxiety, nicotine dependence, alcoholism, motivation, living as a couple, and presence of smokers in the household and in the workplace. This article is organized by illustrating each predictor focusing on seminal work and critical studies to elucidate key outcomes. Suggestions will be generated in order to help with decision-making in the context of a busy clinic, to maximize physicians' consultation time, and to improve smoking cessation outcomes in primary care.

Barrier to smoking cessation

The large majority of smokers around the world desire to quit for good; but this is not easy. In the United States more than 70% of adult cigarette smokers had made at least one attempt to quit during their smoking careers, and approximately 41% of them had tried to quit in the previous 12 months.⁹ Nevertheless, only about 7% of self-quitters were still abstinent 1 year later.⁷ Such low quit rates have attracted interest in the area of professional and behavioural counselling and stimulated investment in the development of pharmacological aids for smoking cessation. Evidence shows that brief advice from a medical professional and behavioural support are effective in motivating smokers to quit and that more intensive interventions are more effective than minimal interventions.^{10–12} Moreover, adding

drugs for smoking cessation (including NRT and non-nicotine treatments) to these interventions can approximately double the rate of abstinence in motivated smokers.^{13,14} Details about pharmacological and non-pharmacological smoking cessation interventions will not be covered here, and it is recommended to refer to previous excellent review articles on this specific subject.^{7,15,16}

Despite the development of several cessation strategies, the overall success rate of long-term smoking abstinence is modest, even when intensive interventions are implemented.^{13–16} This underscores the notion that smoking cessation requires a substantial change in lifestyle and for most smokers this remains a high-effort task. It usually requires multiple quit attempts as well as persistence in executing cognitive and behavioural coping skills and resisting smoking in the face of aversive withdrawal symptoms, negative affect, and powerful urges or cravings. Besides psychological factors, quitting is also likely to involve pharmacological factors and both may be under the influence of specific genetic polymorphisms.^{17,18}

Predictors of smoking cessation

The notion that many smokers respond poorly to smoking cessation efforts has fuelled the physicians' negative attitudes towards smoking cessation and it is likely to influence their priorities with regard to an efficient use of their consultation time.⁸ One way of addressing these physicians' negative beliefs and attitudes is by emphasizing that valuable predictors of smoking cessation can be easily identified. Several factors are known to indicate whether a smoker is more or less likely to quit and their acquaintance can be translated into an efficient use of physicians' consultation time. Our search has identified a number of common predictors that can be grouped into the following domains: personal–demographic and social/familial context (e.g., sex, age, age at smoking initiation, previous quit attempts, living as a couple, smokers in the household and in the workplace), psycho(patho)logical/physio(patho)logical, (e.g., depression, anxiety, nicotine dependence, alcoholism), and cognitive (e.g., motivation) (Table 1).

Gender-specific predictors

Many studies have suggested that men have a better long-term outcome than women. Although women smoke fewer cigarettes and attempt to quit smoking at the same rate as men,⁷ they appear to be less likely to succeed at quitting smoking than men, whether trying to quit on their own or using some type of cessation assistance (nicotine replacement therapy - NRT or bupropion).^{19–21} The observation of lower quit rates for women receiving NRT is often cited as evidence for the hypothesis that women may be less likely to obtain therapeutic benefit from NRT.²²

That women have usually a worse long-term outcome than men has been generally attributed to women's greater concerns about weight gain as a precipitant for relapse. As a matter of fact, cigarette smoking for many women is an effective aid used to control weight.²³ Furthermore, women appear to be less motivated to quit smoking.^{24,25} Probably, this occurs because women are more likely to

Table 1 Common predictors of smoking cessation

Domain	Factor	Practical suggestions	Odds ratios
Personal/socio-demographic	Female gender	Although several studies have suggested that men have a better long-term outcome than women, it is interesting to note that in real-world situations there is no gender difference in effectiveness of smoking cessation treatment. Special considerations often must be given when assisting women to quit smoking. These include addressing bodyweight gain concerns, the question of medication use in pregnant smokers, influences on mood and withdrawal, the impact of social support, and the possibility of greater sensitivity of women to environmental cues associated with smoking. Some medications can help attenuate bodyweight gain, at least temporarily, and even responsiveness to cues. Greater focus on developing improved counselling interventions for these and other issues surrounding cessation could substantially enhance quit rates in women. ³³	NRT was effective at all time points in men (<6 months: OR = 2.05, 95% CI = 1.61–2.60; 6 months: OR = 1.98, 95% CI = 1.51–2.60; 12 months: OR = 1.86, 95% CI = 1.39–2.50) and women (<6 months: OR = 2.09, 95% CI = 1.65–2.65; 6 months, OR = 1.52, 95% CI = 1.17–1.98; 12 months: OR = 1.63, 95% CI = 1.22–2.18). At all time points, no significant difference was observed between sexes (<6 months: OR = 0.97, 95% CI = 0.69–1.36; 6 months: OR = 1.33, 95% CI = 0.91–1.95; 12 months: OR = 1.21, 95% CI = 0.79–1.84).
	Age at smoking initiation	Early smoking initiation points to significant nicotine dependency and high risk of relapse ^{37–39} ; it is advised to institute an aggressive smoking cessation strategy from the beginning.	Men who started smoking before 16 years of age had an OR of 2.1 (95% confidence interval: 1.4–3.0) for not quitting smoking compared to those who started at a later age.
	Previous quit attempts	A positive history of previous quit attempts should be exploited to boost motivation, because if a smoker managed to quit in the past it is more likely that he/she will be successful in a future smoking cessation attempt. In particular, given that the longer a smoker remained abstinent (>5 days), the more he or she is likely to succeed on a subsequent attempt, the physician might reinforce any effort to extend abstinence, at least as practice for the next attempt. Also it is important to elicit what led to previous relapses, in order to identify ways to prevent future relapse. ^{44–46}	Among men, the longest previous quit attempt (OR = 1.09, 95% CI = 0.68–1.02) was positively related to success at 1 year. Among women, the longest previous quit attempt (OR = 1.23, 95% CI = 1.11–1.39) was associated with cessation at 1 year.
	Being married (living as a couple) and/or not having any other smokers in the household.	It is important to take advantage of social–familial support as part of an existing smoking cessation program. ^{7,116,121}	Not having any other smokers in the household is a strong predictor of success with an OR of 1.43, 95% CI = 1.25–1.65

Psychological and physiological	Depression	During consultation it is advised to ascertain systematically whether a history of depression is present. Smokers in this category are likely to experience intense withdrawal symptoms and will benefit from intensive pharmacological treatment for smoking cessation during the first 2–3 weeks of abstinence. Moreover, a judicious use of antidepressants should be considered and a referral to a specialist for the most challenging cases is advised. ^{58–60}	Participants treated with antidepressants had a positive association between degree of depression and likelihood of abstinence (OR = 1.35 [CI = 1.00–1.81]); for controls, the opposite was true, and increasing depression scores were associated with decreasing likelihood of abstinence. Smokers with recurrent major depressive disorder and heavy smokers who were treated for depression were significantly more likely to be abstinent than those receiving standard cognitive behavioural therapy (OR = 2.3 [CI = 1.05–5.03] and 2.62 [CI = 1.18–5.83]). Compared with non-nicotine-dependent smokers or non-smokers, those with nicotine dependence have a greater risk for having one or more anxiety disorders (OR = 2.2 for males and 2.6 for females)
	Anxiety	During consultation it is advised to ascertain the level of anxiety by using simple validated questionnaires such as the Hamilton Anxiety Scale (HAM-A). ⁷² Be aware that anxiety is one of the nicotine withdrawal symptoms and smokers should be advised that their level of anxiety may increase within the first couple of weeks after smoking cessation. Smokers in this category will benefit from pharmacological treatment for smoking cessation during the first 2–3 weeks of abstinence. Moreover, a judicious use of anxiolytic drugs may be considered in individual cases. ⁷³	
	High level of nicotine dependence	In general, smokers with a FTND ≥ 7 are likely to experience intense withdrawal symptoms and may be expected to relapse early. Smokers in this category could benefit from more intensive pharmacological treatment for smoking cessation during the first weeks of abstinence. ^{74,76}	Characteristics that reduced the odds of quitting included two indicators of nicotine dependence (smoking within 30 min of waking and higher cotinine levels). Smoking within 30 min of waking (OR = 0.40; 95% CI = 0.25–0.62) and higher salivary cotinine levels at baseline (OR = 0.799; 95% CI = 0.629–0.922). Efficacy of nicotine replacement or bupropion for smoking cessation in smokers with past alcohol problems vs. smokers with no alcohol problems. NRT vs. Placebo OR in smokers with no problems 2.7 (1.5–4.6); OR in smokers with past problems 4.1 (0.2–92.7). Bupropion vs. Placebo OR in smokers with no problems 1.7 (1.1–2.5); OR in smokers with past problems 1.9 (0.4–8.6).
	Alcohol use and abuse	All smokers should be advised to quit by their physician, but if a history of current alcoholism is present, a referral to a specialist centre may be recommended, because smokers in this category have been shown to perform poorly in smoking cessation programs. ^{86,87,89} However, a smoker with a mild alcohol problem, probably would not need to be referred to a specialist. In addition, the notion that even low to moderate levels of alcohol consumption during smoking cessation may decrease treatment success calls for a sensible plan against alcohol use during smoking cessation efforts.	
Cognitive	Low motivation to stop smoking	Motivational interviewing may be required. ^{102,104} For those not interested in quitting, it is important that some motivational counselling occur during the medical visit, which is a window of opportunity. Alternatively, physicians should be encouraged to use their regular contacts with smokers to gradually increase their level of motivation towards a quit attempt with the "5 R's": Relevance, Risks, Rewards, Roadblocks, and Repetition. ¹⁰⁷	None reported

anticipate negative outcomes associated with smoking cessation (such as weight gain, increases in negative mood, reduced ability to concentrate, and loss of enjoyment) compared to men.²¹ As a final point, women have higher rates of depression than men and are more likely to use smoking as a means of handling negative affects.²⁶ Negative mood (including depression, anxiety, irritability, and impaired concentration) is generally associated with failure to quit in women.^{27–29}

Contrary to the notion that women may be less likely to quit, two separate meta-analyses have found NRT and bupropion equally effective in men and women.^{30,31} Randomised controlled trials included in these meta-analyses may not reflect risk factors for failure in real-life setting. However, it is interesting to note that in real-world situations there is no gender difference in effectiveness of smoking cessation treatment.³²

Special attention must be given when assisting women quitting smoking. These include addressing bodyweight gain concerns, the question of medication use in pregnant smokers, the influence of social support, and the possibility of greater sensitivity of women to environmental cues associated with smoking. Some medications can help attenuate bodyweight gain, at least temporarily, and even responsiveness to cues. Targeted counselling interventions for these and other issues surrounding cessation could enhance quit rates in women,³³ but there is a need to understand more about the role of gender influences.

Age at smoking initiation

Early initiation of cigarette smoking has been associated with greater consumption, longer duration of smoking, and increased nicotine dependence.^{34,35} Taioli and Wynder³⁵ observed that those who began smoking before age 14 were more likely to become heavy smokers than those who began when they were 20 years of age or older. That age at initiation of smoking is a significant factor for continuation of smoking later in life, has been convincingly demonstrated by the work of Hymowitz et al.,³⁶ which analysed smoking cessation data from a prospective cohort of 13,415 cigarette smokers; statistically significant predictors of smoking cessation included initiation of smoking after age 20. In an extension of their previous work, Breslau et al.³⁷ investigated the relationship between smoking cessation and age of initiation and found that in a sample of 1007 randomly selected young adults the likelihood of cessation was significantly lower in smokers who initiated smoking before age 13. Similar findings were observed by Khuder et al.³⁸; those who started smoking before 16 years of age had an odds ratio of 2.1 for not quitting smoking compared to those who started at a later age. The same authors observed that, in addition, early age at initiation may also affect the length of abstinence time; those who started smoking before age 16 had a mean of 6.7 years of abstinence from smoking, in comparison to 11 years for those who started at a later age. It is postulated that early exposure to tobacco could detrimentally affect a developing brain thus leading to greater nicotine dependence later in life. In addition, age at smoking initiation appears to be significantly related to smoking cessation, with smoking initiation at early age appearing to be a critical factor influencing smoking cessation. That early age of

initiation predicts more dependent smoking was also reported in a sample of 2120 adult smokers in 24 worksites in the US.³⁹

When a history of early smoking initiation is obtained, it is advised to institute an aggressive smoking cessation strategy from the beginning. Physicians should be aware that smokers in this category are at high risk of relapse and need to understand that successful cessation will require multiple attempts.

Previous quit attempts

A history of previous quit attempts is an important indicator for the success of future quitting in both adult and adolescent smokers.^{40–44} Both *number* and *duration* of previous unassisted quit attempts are important predictors of subsequent long-term cessation. However, those who have made any quit attempts that lasted longer than 5 days are much more likely to succeed than those who have not sustained a quit for that long. Specifically, in women who smoke⁴⁵ the length of previous quit attempt significantly predicted quitting vs. smoking or dropout, over and above all other variables. Women with longer previous quit attempts were 36% more likely to quit than to continue smoking or drop out. Conversely, reported shorter periods of abstinence on prior *quit attempts* were markedly associated to relapse.⁴⁶

A positive history of previous quit attempts should be exploited to boost motivation, because if a smoker managed to quit in the past it is more likely that he/she will be successful in a future smoking cessation attempt. In particular, given that the longer a smoker remained abstinent (>5 days), the more he or she is likely to succeed on a subsequent attempt, the physician might reinforce any effort to extend abstinence, at least as practice for the next attempt. Also it is important to elicit what led to previous relapses, in order to identify ways to prevent future relapse.^{44–46}

Depression

The association between nicotine dependence and affective disorders, particularly major depressive disorder (MDD), is well known with high prevalence rates being reported for smokers.^{47,48} The reason for this association is not clear, but it has been argued that smoking may help individuals to cope with stress⁴⁹ or mediate depressed mood.⁵⁰ In support of this hypothesis, it has been shown that smokers with a history of depression who abstain from smoking are at significantly increased risk of developing a new episode of major depression and this risk remains high for at least 6 months.^{51,52} On the other hand, there is evidence that current cigarette use could be an important determinant of developing depressive symptoms in adolescence.⁵³ Moreover, it cannot be excluded that a shared vulnerability could be playing a role.⁵⁴ Whatever the mechanisms of this association, it is likely that the burden of affective disorders will increase with the current escalation of smokers worldwide.⁵⁵

Until recent years, the belief that a history of depression greatly decreases the likelihood of quitting smoking has

been widely promoted.⁵⁶ It must be noted that the process of cessation itself produces withdrawal symptoms, which include a variety of mood disturbances and affective symptoms (depressed mood, anxiety, nervousness, restlessness, irritability, fatigue, and drowsiness); these are more pronounced in the days immediately following cessation and generally return to baseline levels within a month of continued abstinence. These differences in mood disturbance appear to be related to successful cessation as well. Predictably, smokers reporting higher levels of negative mood and depressive symptoms were less likely to quit than were smokers with less mood disturbance.⁴⁸

Although it is generally assumed that a history of depression may be a barrier to quitting smoking, contradictory evidence also exists.^{57,58} The meta-analysis by Hitsman et al.⁵⁷ shows that lifetime history of major depression does not appear to be an independent risk factor for cessation failure in smoking cessation treatment. Likewise, a recent paper from the Veterans Administration Normative Aging Study shows that the presence of depressive symptoms did not have a significant impact on smoking cessation.⁵⁸

During consultation it is advised to ascertain systematically whether a history of depression is present by using simple validated questionnaires such as the Beck Depression Inventory (BDI).⁵⁹ Smokers in this category are likely to experience intense withdrawal symptoms and will benefit from intensive pharmacological treatment for smoking cessation during the first 2–3 weeks of abstinence. Moreover, a judicious use of antidepressants should be considered and a referral to a specialist for the most challenging cases is advised.^{60–62}

Anxiety

Smoking is highly prevalent across most anxiety disorders and varies widely, depending on the specific diagnosis and the sample selected.⁶³ The highest prevalence estimates of smoking have been found among those with panic disorder with or without agoraphobia^{63,64} and among those with post-traumatic stress disorder.^{65,66} A high prevalence of smoking has also been identified among individuals with social anxiety disorder, generalized anxiety disorder, and specific phobias.^{63,64,67}

Smokers with anxiety disorders have more severe withdrawal symptoms during smoking cessation than smokers without anxiety disorders.⁶⁸ Moreover, smokers commonly implicate anxiety as a risk factor for relapse to smoking.^{63,69} In these cases, psychological treatments that incorporate cognitive restructuring of automatic thoughts may also have considerable utility.⁶³

Understanding the functional relationship between smoking behaviour and anxiety is important to improve assistance to those who are trying to quit, but additional research is also needed to understand factors contributing to the development, maintenance, and relapse to smoking that are important to smokers with anxiety disorders.

Although no treatment outcome studies have been published to date regarding smoking cessation and anxiety disorders specifically, a natural extension for smoking cessation treatment in patients with anxiety disorders can be made from the panic disorder and benzodiazepine withdrawal treatment literature. Several studies have

documented the benefit of simultaneously tapering benzodiazepines during cognitive–behavioural therapy for panic disorder.^{70,71}

During consultation it is advised to ascertain the level of anxiety by using simple validated questionnaires such as the Hamilton Anxiety Scale (HAM-A).⁷² Be aware that anxiety is one of the nicotine withdrawal symptoms and smokers should be advised that their level of anxiety may increase within the first couple of weeks after smoking cessation. Smokers in this category will benefit from pharmacological treatment for smoking cessation during the first 2–3 weeks of abstinence. Moreover, a judicious use of anxiolytic drugs may be considered in individual cases.⁷³

Nicotine dependence

Severity of nicotine dependence has been described to be an important predictor of successful smoking cessation, both in the context of studies with bupropion^{74,75} in trials with nicotine replacement therapy⁷⁶ and in studies of cessation without adjuvant pharmacotherapy.^{77,78} Severity of nicotine dependence is generally assessed by means of the Fagerström Test for Nicotine Dependence (FTND),⁷⁹ a straightforward 6-item questionnaire that takes less than one minute to be administered. Results are expressed as scores ranging from 0 to 10, the highest score indicating a very high level of nicotine dependence. Typically, smokers with severe nicotine dependence are characterized by a FTND ≥ 7 .⁷⁹ Such nicotine dependence measures also appear to identify those smokers requiring high-dose nicotine pharmacotherapy.^{80,81} There are nonetheless a number of studies that have failed to confirm the predictive validity of these widely used dependence measures.^{82–84} However, the supportive evidence is reasonably strong and dependence measures are generally recommended as a key indicator for nicotine dependence or as an important predictor of cessation success.^{10,85}

In general, smokers with a FTND ≥ 7 are likely to experience intense withdrawal symptoms and may be expected to relapse early. Smokers in this category could benefit from more intensive pharmacological treatment for smoking cessation during the first weeks of abstinence.^{74,76} Successful cessation may require multiple attempts.

Alcoholism

Current alcoholism is a negative prognostic factor for successful smoking cessation and discontinuation of alcoholism is likely to increase the potential for successful smoking cessation. After correcting for sex, age and race, population studies have shown that smokers with active alcoholism in the preceding year were 60% less likely to quit than were smokers with no history of alcoholism.⁸⁶ It was also interesting to observe that smokers whose alcoholism had remitted were at least as likely to quit as smokers reporting no alcohol use, with a greater than threefold increase in the likelihood of subsequent smoking cessation compared with smokers with current alcohol use. The notion that current alcoholism may interfere with the success of smoking cessation was confirmed in subsequent studies of smokers attending smoking cessation clinics, which

predicted smoking relapse not only for smokers with current alcoholism at baseline but also for any alcohol use during cessation treatment.⁸⁷ Conversely, it appears that smoking cessation did not precipitate an alcoholic relapse⁸⁸ and in actual fact smoking cessation programs appear to improve quit rates in abusers undergoing alcohol treatment.^{89–91} Although the reasons for the detrimental effect of alcoholism on smoking cessation are unclear, controlled studies have shown that alcohol has the ability of producing a generalized increase in reported urge to smoke.^{92,93}

There is currently increasing support for addressing smoking cessation in alcohol dependent persons, but the most efficacious strategies for smoking cessation in this population are not clear.⁹⁴ Behavioural therapy strategies are clearly important in smoking cessation programs for the general population, but it appears that low-intensity programs are not effective in patients in alcohol treatment.⁹⁵ Behavioural therapy for smoking cessation that are similar to standard counselling approaches for alcohol dependence has been shown to be very effective in recovering alcoholics with quit rates at 1 year that are comparable to persons without an alcohol addiction history at approximately 25%.⁹⁶

All smokers should be advised to quit by their physician, but if a history of current alcoholism is present, a referral to a specialist centre may be recommended, because smokers in this category have been shown to perform poorly in smoking cessation programs.^{86,87} However, a smoker with a mild alcohol problem, probably would not need to be referred to a specialist. In addition, the notion that even low to moderate levels of alcohol consumption during smoking cessation may decrease treatment success calls for a sensible plan against alcohol use during smoking cessation efforts.

Motivation

Individual motivation to stop smoking appears to be important in predicting whether a given cessation attempt will be successful.^{97,98} Accumulating evidence indicates that initial levels of motivation to quit smoking can predict success with smoking cessation.^{99–101} Tests to assess the level of motivation are available, but these are cumbersome, time-consuming or poorly validated. However, physicians can ask smokers to rate their level of motivation or confidence on a scale of 0–10; this can be quite useful and it takes about 30 sec.¹⁰²

As the effect of motivation on outcome appears to wane with time (usually in a few weeks),¹⁰³ it is imperative that physicians take full advantage of the smoker's momentum and set a quit date as soon as possible. The medical visit is a time in which health is salient, and smokers may be more receptive to attempts aimed at increasing their level of motivation. Motivational interviewing is a client-centered, directive method for enhancing motivation to change by exploring and resolving ambivalence. Brief versions of motivational interviewing that can be easily incorporated into the medical visit are also available.¹⁰⁴

There is also accumulating evidence that nature of motivation for smoking cessation is an important component of the smoking cessation process. The intrinsic–extrinsic model of motivation shows promise for understanding the

smoking cessation dynamics and refers to the origins of the desire to engage in a particular behaviour. Intrinsically motivated behaviours are generally driven by the anticipation of rewards that are internal to the person (e.g., improved health, self-confidence), whereas extrinsically motivated behaviours respond to external rewards or punishments (e.g., financial gains, social approval). Although both types of motivation may initiate behaviour change, intrinsically motivated behaviour has been associated with sustained changes in health behaviours, including involvement in addiction treatment.¹⁰⁵ Longitudinal studies found that higher levels of intrinsic relative to extrinsic motivation predict smoking cessation among self-selected, volunteer samples of smokers seeking assistance in quitting¹⁰⁶ and in a general population sample of smokers.⁹⁹ Thus, assessing intrinsically motivated behaviour during consultation by means of simple questions may be useful and can be stimulated by motivational interviewing.

In practice, it is best to consider the level of the smoker's commitment/effort in relation to the tasks set in his/her specific smoking cessation program. Our duty as physicians is to keep these smokers motivated throughout their cessation efforts by means of frequent consultations and motivational interviewing. For those not interested in quitting, it is important that some motivational counselling occur during the medical visit, which is a window of opportunity. Alternatively physicians should be encouraged to use their regular contacts with smokers to gradually increase their level of motivation towards a quit attempt with the "5 R's": Relevance, Risks, Rewards, Roadblocks, and Repetition.¹⁰⁷ Over time, this very brief encouragement, in context of ongoing care, can pay off and open the door for more productive consultation later on.

Social/familial environment

Initiation, maintenance and cessation of smoking appear to be strongly influenced by the social environment. Smokers are more inclined to consider a cessation attempt if they figure out that people, whose opinion is valued, feel that they should quit smoking and if they comprehend that smoking is unacceptable behaviour in a number of social situations. In a recent British study¹⁰⁸ the strongest socio-demographic predictors of quitting smoking in a large group of adult smokers were, occupational social class, social support, and the number of smokers in the household. In particular, marital status and the level of support by family members appear to be important predictor of smoking cessation. These findings are similar to those published by West et al.,¹⁰⁹ who found that smokers whose partners objected to smoking were more likely to quit, and by Gourlay et al.,¹¹⁰ who found that marital status and the presence of smokers in the household were the strongest predictors of quitting smoking.

Smokers are more likely to marry smokers, to smoke an equivalent number of cigarettes as their spouse, and to quit at the same time.¹¹¹ Smokers who are married to non-smokers or ex-smokers are more likely to quit and remain abstinent.¹¹² The notion that support from the spouse is highly predictive of successful smoking cessation has been known for a long time.¹¹³ In particular, supportive behaviours involving cooperative behaviours (e.g., talking the

smoker out of smoking the cigarette), and reinforcement (e.g., expressing pleasure at the smoker's efforts to quit), is likely to predict successful quitting whereas, negative behaviours (e.g., nagging the smoker and complaining about smoking) are likely to be predictive of relapse. Thus supportive behaviours were shown to be associated with successful smoking cessation, whereas negative or critical behaviours were related with earlier relapse.¹¹⁴ That family support is an important component of effective cessation stems from the notion that two recent systematic reviews addressing the effectiveness of partner or social support interventions in smoking cessation have concluded that these interventions may be of some benefit.^{7,115}

Several studies have shown that age is another important social determinants of smoking cessation in the general population. Higher success rates have been commonly reported for older subjects.^{36,116,117}

The work environment is another important social determinants of smoking cessation. It influence changes in smoking in the following ways: the work environment might influence the probability of smoking cessation; the probability of relapse following initial cessation, and the amount of cigarettes smoked.¹¹⁸

Stressors in the work environment might contribute to increased smoking or make it harder to quit.^{119–123} Resources in the work environment, e.g., decision latitude or rewards, might strengthen the individual resources and make it easier to reduce smoking, to quit or to avoid relapse.¹²⁴

Social support can influence changes in smoking. Social support to quit can make cessation easier. Conversely, the presence of smoking co-workers can contribute to increased smoking and counteract cessation.¹²³

In these authors' opinion it is important to consider partner and social–familial support as part of an existing smoking cessation program. However, given that physicians may be very influential on their patients' health decisions, their support should not be underestimated.

Final considerations

Despite the clear benefits of helping smokers to quit, there is a growing trend in physicians' indifference or skepticism towards the efficacy of smoking cessation programs.⁸ This may be due to a number of reasons including poor understanding of the natural history of cessation, the under use of smoking cessation services, improper use of drugs for nicotine dependence when prescribed and lack of awareness of common predictors of smoking cessation. Physicians' expectations of successful cessation must be reframed since most smokers are known to relapse at some stage. For those who relapse, it is important to maintain contact so that relapse can be caught early enough to facilitate rescue. Typically, multiple attempts are required before achieving success. A better understanding of predictors of smoking cessation can be useful in identifying potential quitters and likely relapsers.

Several factors are known to indicate whether a smoker is more likely to quit and our search has identified a number of common predictors such as late initiation of cigarette smoking, longer duration of previous quit attempts, lack of depression and anxiety, low to moderate

nicotine dependence, absence of alcohol problems, sustained level of motivation, being married and/or not having any other smokers in the household and/or in the workplace (Table 1).

Conflict of interest

None.

Acknowledgements

Supported by an educational grant by LIAF (Lega Italiana AntiFumo) and University of Catania.

References

1. US Department of Health and Human Services. *The health consequences of smoking: a report of the Surgeon General*. Washington: Government Printing Office; 2004.
2. Doll R, Peto R, Boreham J, Sutherland I. Mortality in relation to smoking: 50 years' observations on male British doctors. *BMJ* 2004;**328**:1519–28.
3. Garfinkel L. Selection, follow-up and analysis in the American Cancer Society prospective studies. In: Garfinkel L, Ochs O, Mushinski M, editors. *Selection, follow-up and analysis in prospective studies: a workshop*. National Cancer Institute; 1985. p. 49–52.
4. Peto R, Lopez AD, Boreham J, Thun M. Mortality from smoking in developed countries 1950–2010. In: *Imperial cancer research fund, WHO*. 2nd ed. Oxford: Oxford University Press; 2004.
5. Wang L, Kong L, Wu F, Bai Y, Burton R. Preventing chronic diseases in China. *Lancet* 2005;**366**:1821–4.
6. US Department of Health and Human Services. *The health benefits of smoking cessation*. US Department of Health and Human Services, Public Health Service, Centers for Disease Control, Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 1990 (DHHS Publication No. (CDC) 90–8516).
7. Fiore MC, Bailey WC, Cohen SJ, Dorfman SF, Goldstein MG, Gritz EF, et al. *Treating tobacco use and dependence: clinical practice guidelines*. Rockville, MD: U.S. Department of Health and Human Services. Public Health Service; 2000.
8. Vogt F, Hall S, Marteau TM. General practitioners' and family physicians' negative beliefs and attitudes towards discussing smoking cessation with patients: a systematic review. *Addiction* 2005;**100**(10):1423–31.
9. Centers for Disease Control and Prevention. Cigarette smoking among adults—United States, 1999. *MMWR Morb Mortal Wkly Rep* 2001;**50**(40):869–73.
10. American Psychiatric Association. Practice guideline for the treatment of patients with nicotine dependence. *Am J Psychiatry* 1996;**153**(10):1–31.
11. Lancaster T, Stead L. Physician advice for smoking cessation. *Cochrane Database Syst Rev* 2004;**18**(4):CD000165.
12. Coleman T. ABC of smoking cessation. Use of simple advice and behavioural support. *BMJ* 2004;**328**:397–9.
13. Hughes JR, Goldstein MG, Hurt RD, Shiffman S. Recent advances in the pharmacotherapy of smoking. *JAMA* 1999;**281**(1):72–6.
14. Okuyemi KS, Ahluwalia JS, Harris KJ. Pharmacotherapy of smoking cessation. *Arch Fam Med* 2000;**9**(3):270–81.
15. Lancaster T, Stead L, Silagy C, Sowden A. Effectiveness of interventions to help people stop smoking: findings from the Cochrane Library. *BMJ* 2000;**321**:355–8.

16. Wu P, Wilson K, Dimoulas P, Mills EJ. Effectiveness of smoking cessation therapies: a systematic review and meta-analysis. *BMC Public Health* 2006;**6**:300.
17. Walton R, Johnstone E, Munafò M, Neville M, Griffiths S. Genetic clues to the molecular basis of tobacco addiction and progress towards personalized therapy. *Trends Mol Med* 2001;**7**:70–6.
18. Batra V, Patkar AA, Berrettini WH, Weinstein SP, Leone FT. The genetics determinants of smoking. *Chest* 2003;**123**:1730–9.
19. US Department of Health and Human Services (USDHHS). *The health consequences of smoking: women and smoking*. Atlanta: US Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 2001.
20. Swan GE, Jack LM, Ward MM. Subgroups of smokers with different success rates after use of transdermal nicotine. *Addict* 1997;**92**:207–17.
21. Scharf D, Shiffman S. Are there gender differences in smoking cessation, with and without bupropion? Pooled- and meta-analyses of clinical trials of Bupropion SR. *Addict* 2004;**99**(11):1462–9.
22. Perkins K, Gerlach D, Vender J, Grobe J, Meeker J, Hutchison S. Sex differences in the subjective and reinforcing effects of visual and olfactory cigarette smoke stimuli. *Nicotine Tob Res* 2001;**3**:141–50.
23. Perkins KA, Levine MD, Marcus MD, Shiffman S. Addressing women's concerns about weight gain due to smoking cessation. *J Subst Abuse Treat* 1997;**14**:173–82.
24. Ward KD, Klesges RC, Zbikowski SM, Bliss RE, Garvey AJ. Gender differences in the outcome of an unaided smoking cessation attempt. *Addict Behav* 1997;**22**(4):521–33.
25. Etter J, Prokhorov AV, Pernerger TV. Gender differences in the psychological determinants of cigarette smoking. *Addict* 2002;**97**:733–43.
26. Munafò M, Bradburn M, Bowes L, David S. Are there sex differences in transdermal nicotine replacement therapy patch efficacy? A meta-analysis. *Nicotine Tob Res* 2004;**6**(5):769–76.
27. Chatkin JM, Abreu CM, Blanco DC, Tonietto R, Scaglia N, Wagner MB, et al. No gender difference in effectiveness of smoking cessation treatment in a Brazilian real-life setting. *Int J Tuberc Lung Dis* 2006;**10**(5):499–503.
28. McKee SA, O'Malleya SS, Saloveyb P, Krishnan-Sarina S, Mature CM. Perceived risks and benefits of smoking cessation: gender-specific predictors of motivation and treatment outcome. *Addict Behav* 2005;**30**(3):423–35.
29. Chatkin JM, Mariante de Abreu C, Haggström FM, Wagner MB, Fritscher CC. Abstinence rates and predictors of outcome for smoking cessation: do Brazilian smokers need special strategies? *Addict* 2004;**99**:778–84.
30. Borrelli B, Marcus BH, Clark MM, Bock BC, King TK, Roberts M. History of depression and subsyndromal depression in women smokers. *Addict Behav* 1999;**24**(6):781–94.
31. Kassel JD, Stroud LR, Paronis CA. Smoking, stress, and negative affect: correlation, causation, and context across stages of smoking. *Psychol Bull* 2003;**129**:270–304.
32. Westmaas JL, Langsam K. Unaided smoking cessation and predictors of failure to quit in a community sample: effects of gender. *Addict Behav* 2005;**30**(7):1405–24.
33. Perkins KA. Smoking cessation in women. Special considerations. *CNS Drugs* 2001;**15**(5):391–411.
34. Breslau N, Fenn N, Peterson EL. Early smoking initiation and nicotine dependence in a cohort of young adults. *Drug Alcohol Depend* 1993;**33**(2):129–37.
35. Taioli E, Wynder EL. Effect of the age at which smoking begins on frequency of smoking in adulthood. *N Engl J Med* 1991;**325**:968–9.
36. Hymowitz N, Cummings KM, Hyland A, Lynn WR, Pechacek TF, Hartwell TD. Predictors of smoking cessation in a cohort of adult smokers followed for five years. *Tob Control* 1997;**6**(Suppl. 2):S57–62.
37. Breslau N, Peterson EL. Smoking cessation in young adults: age at initiation of cigarette smoking and other suspected influences. *Am J Public Health* 1996;**86**:214–20.
38. Khuder SA, Dayal HH, Mutgi AB. Age at smoking onset and its effect on smoking cessation. *Addict Behav* 1999;**24**(5):673–7.
39. Lando HA, Thai DT, Murray DM, Robinson LA, Jeffery RW, Sherwood NE, et al. Age of initiation, smoking patterns, and risk in a population of working adults. *Prev Med* 1999;**29**(6 Pt. 1):590–8.
40. Etter JF. Associations between smoking prevalence, stages of change, cigarette consumption, and quit attempts across the United States. *Prev Med* 2004;**38**(3):369–73.
41. Zhu SH, Sun J, Billings SC, Choi WS, Malarcher A. Predictors of smoking cessation in U.S. adolescents. *Am J Prev Med* 1999;**16**(3):202–7.
42. Hymowitz N, Sexton M, Ockene J, Grandits G. Baseline factors associated with smoking cessation and relapse: MRFIT research group. *Prev Med* 1991;**20**(5):590–601.
43. Farkas AJ, Pierce JP, Zhu SH, Rosbrook B, Gilpin EA, Berry C, et al. Addiction versus stages of change models in predicting smoking cessation. *Addict* 1996;**91**(9):1271–80.
44. Murray RP, Gerald LB, Lindgren PG, Connett JE, Rand CS, Anthonisen NR. Characteristics of participants who stop smoking and sustain abstinence for 1 and 5 years in the Lung Health Study. *Prev Med* 2000;**30**(5):392–400.
45. Borrelli B, Hogan JW, Bock B, Pinto B, Roberts M, Marcus B. Predictors of quitting and dropout among women in a clinic-based smoking cessation program. *Psychol Addict Behav* 2002;**16**(1):22–7.
46. Garvey AJ, Bliss RE, Hitchcock JL, Heinold JW, Rosner B. Predictors of smoking relapse among self-quitters: a report from the Normative Aging Study. *Addict Behav* 1992;**17**(4):367–77.
47. Breslau N, Kilbey M, Andreski P. Nicotine dependence and major depression. *Arch Gen Psychiatry* 1993;**50**:31–5.
48. Anda RF, Williamson DF, Escobedo LG, Mast EE, Giovino GA, Remington PL. Depression and the dynamics of smoking. *JAMA* 1990;**264**:1541–5.
49. Revell AD, Warburton DM, Wesnes K. Smoking as a coping strategy. *Addict Behav* 1985;**10**(3):209–24.
50. Covey LS, Glassman AH, Stetner F. Major depression following smoking cessation. *Am J Psychiatry* 1997;**154**(2):263–5.
51. Kinnunen T, Henning L, Nordstrom BL. Smoking cessation in individuals with depression: recommendations for treatment. *CNS Drugs* 1999;**11**:93–103.
52. Glassman AH, Covey LS, Stetner F, Rivelli S. Smoking cessation and the course of major depression: a follow-up study. *Lancet* 2001;**357**:1929–32.
53. Goodman E, Captiman J. Depressive symptoms and cigarette smoking among teens. *Pediatrics* 2000;**106**(4):748–55.
54. Fergusson DM, Lynskey MT, Horwood LJ. Comorbidity between depressive disorders and nicotine dependence in a cohort of 16 years olds. *Arch Gen Psychiatry* 1996;**53**(11):1043–7.
55. Murphy JM, Horton NJ, Monson RR. Cigarette smoking in relation to depression: historical trends from the Stirling County Study. *Am J Psychiatry* 2003;**160**:1663–9.
56. Glassman AH. Cigarette smoking: implications for psychiatric illness. *Am J Psychiatry* 1993;**150**(4):546–53.
57. Hitsman B, Borrelli B, McChargue DE, Spring B, Niaura R. History of depression and smoking cessation outcome: a meta-analysis. *J Consult Clin Psychol* 2003;**71**(4):657–63.
58. Kinnunen T, Haukka A, Korhonen T, Quiles ZN, Spiro A, Garvey AJ. Depression and smoking across 25 years of the Normative Aging Study. *Int J Psychiatry Med* 2006;**36**(4):413–26.
59. Beck AT, Ward CH, Mendelson M, Mock J, Erbaugh J. An inventory for measuring depression. *Arch Gen Psychiatry* 1961;**4**:561–71.

60. Blondal T, Gudmundsson LJ, Tomasson K, Jonsdottir D, Hilmarsson H, Kristjansson F, et al. The effects of fluoxetine combined with nicotine inhalers in smoking cessation—a randomized trial. *Addict* 1999;**94**(7):1007–15.
61. Wilhelm K, Arnold K, Niven H, Richmond R. Grey lungs and blue moods: smoking cessation in the context of lifetime depression history. *Aust N Z J Psychiatry* 2004;**38**(11–12):896–905.
62. Hughes JR, Stead LF, Lancaster T. Antidepressants for smoking cessation. *Cochrane Database Syst Rev* 2007;**24**(1):CD000031.
63. Morissette SB, Tull MT, Gulliver SB, Kamholz BW, Zimering RT. Anxiety, anxiety disorders, tobacco use, and nicotine: a critical review of interrelationships. *Psychol Bull* 2007;**133**(2):245–72.
64. McCabe RE, Chudzik SM, Antony MM, Young L, Swinson RP, Zvolensky MJ. Smoking behaviors across anxiety disorders. *J Anxiety Disord* 2004;**18**:7–18.
65. Beckham JC, Kirby AC, Feldman ME, Hertzberg MA, Moore SD, Crawford AL, et al. Prevalence and correlates of heavy smoking in Vietnam veterans with chronic posttraumatic stress disorder. *Addict Behav* 1997;**22**:637–47.
66. Op den Velde W, Aarts PGH, Falger PRJ, Hovens JE, van Duijn H, de Groen JHM, et al. Alcohol use, cigarette consumption and chronic post-traumatic stress disorder. *Alcohol Alcohol* 2002;**37**:355–61.
67. Lasser K, Boyd JW, Woolhandler S, Himmelstein DU, McCormick D, Bor DH. Smoking and mental illness: a population-based prevalence study. *JAMA* 2000;**284**:2606–10.
68. Breslau N, Kilbey MM, Andreski P. Nicotine withdrawal symptoms and psychiatric disorders: findings from an epidemiologic study of young adults. *Am J Psychiatry* 1992;**149**:464–9.
69. Brandon TH, Tiffany ST, Obremski KM, Baker TB. Postcessation cigarette use: the process of relapse. *Addict Behav* 1990;**15**:10514.
70. Otto MW, Pollack MH, Sachs GS, Reiter SR, Meltzer-Brody S, Rosenbaum JF. Discontinuation of benzodiazepine treatment: efficacy of cognitive-behavioral therapy for patients with panic disorder. *Am J Psychiatry* 1993;**150**:1485–90.
71. Spiegel DA, Bruce TJ, Gregg SF, Nuzzarello A. Does cognitive behavioral therapy assist slow-taper alprazolam discontinuation in panic disorder? *Am J Psychiatry* 1994;**151**:876–81.
72. Hamilton M. The assessment of anxiety states by rating. *Br J Med Psychol* 1959;**32**:50–5.
73. Hughes JR, Stead LF, Lancaster T. Anxiolytics for smoking cessation. *Cochrane Database Syst Rev* 2000;**4**:CD000031.
74. Dale LC, Glover ED, Sachs DP, Schroeder DR, Offord KP, Croghan IT, et al. Bupropion for smoking cessation: predictors of successful outcome. *Chest* 2001;**119**(5):1357–64.
75. Harris KJ, Okuyemi KS, Catley D, Mayo MS, Jasjit BG, Ahluwalia S. Predictors of smoking cessation among African-Americans enrolled in a randomized controlled trial of bupropion. *Prev Med* 2004;**38**:498–502.
76. Stapleton JA, Russel MA, Feyerabend C, Wiseman SM, Gustavsson G, Sawe W, et al. Dose effects and predictors of outcome in a randomized trial of transdermal nicotine patches in general practice. *Addiction* 1995;**90**:31–42.
77. Killen JD, Fortmann SP, Kraemer HC, Varady A, Newman B. Who will relapse? Symptoms of nicotine dependence predict long-term relapse after smoking cessation. *J Consult Clin Psychol* 1992;**60**:797–801.
78. Richmond RL, Kehoe LA, Webster IW. Multivariate models for predicting abstinence following intervention to stop smoking by general practitioners. *Addiction* 1993;**88**:1127–35.
79. Heatherton TF, Kozlowski LT, Frecker RC, Fagerstrom KO. The Fagerstrom test for nicotine dependence: a revision of the Fagerstrom tolerance questionnaire. *Br J Addict* 1991;**86**:1119–27.
80. Shiffman S, Di Marino M, Pillitteri JL. The effectiveness of nicotine patch and nicotine lozenge in very heavy smokers. *J Subst Abuse Treat* 2005;**28**:49–55.
81. Balfour D, Benowitz N, Fagerstrom K, Kunze M, Keil U. Diagnosis and treatment of nicotine dependence with emphasis on nicotine replacement therapy. *Eur Heart J* 2000;**21**:438–45.
82. Kenford SL, Fiore MC, Jorenby DE, Smith SS, Wetter D, Baker TB. Predicting smoking cessation. Who will quit with and without the nicotine patch. *JAMA* 1994;**271**(8):589–94.
83. Nides MA, Rakos RF, Gonzales D, Murray RP, Tashkin DP, Bjornson-Benson WM, et al. Predictors of initial smoking cessation and relapse through the first 2 years of the Lung Health Study. *JCCP* 1995;**63**(1):60–9.
84. Raheiser C, Marjary A, Valpromy B, Prevot S, Fossoux H, Tayard A. Evaluation of smoking cessation success in adults. *Re spir Med* 2005;**99**:1303–10.
85. Fiore MC, Jorenby DE, Baker TB. Smoking cessation: principles and practice based upon the AHCPR Guideline, 1996. Agency for Health Care Policy and Research. *Ann Behav Med* 1997;**19**(3):213–9.
86. Breslau N, Peterson E, Schultz L, Andreski P, Chilcoat H. Are smokers with alcohol disorders less likely to quit? *Am J Public Health* 1996;**86**(7):985–90.
87. Humfleet G, Munoz R, Sees K, Reus V, Hall S. History of alcohol or drug problems, current use of alcohol or marijuana, and success in quitting smoking. *Addict Behav* 1999;**24**(1):149–54.
88. Covey LS, Glassman AH, Stetner F, Becker J. Effect of history of alcoholism or major depression on smoking cessation. *Am J Psychiatry* 1993;**150**(10):1546–7.
89. Hurt RD, Eberman KM, Croghan IT, Offord KP, Davis LJ, Morse Jr RM, et al. Nicotine dependence treatment during inpatient treatment for other addictions: a prospective intervention trial. *Alcohol Clin Exp Res* 1994;**18**(4):867–72.
90. Joseph AM. Nicotine treatment at the drug dependency program of the Minneapolis VA Medical Center. A researcher's perspective. *J Subst Abuse Treat* 1993;**10**(2):147–52.
91. Joseph AM, Nichol KL, Willenbring ML, Korn JE, Lysaght LS. Beneficial effects of treatment of nicotine dependence during an inpatient substance abuse treatment program. *JAMA* 1990;**263**:3043–6.
92. Burton SM, Tiffany ST. The effect of alcohol consumption on craving to smoke. *Addict* 1997;**92**(1):15–26.
93. Sayette MA, Martin CS, Wertz JM, Perrott MA, Peters AR. The effects of alcohol on cigarette craving in heavy smokers and tobacco chippers. *Psychol Addict Behav* 2005;**19**(3):263–70.
94. Hurt RD, Patten CA. Treatment of tobacco dependence in alcoholics. *Recent Dev Alcohol* 2003;**16**:335–59.
95. Bobo JK, McIlvain HE, Lando HA, Walker RD, Leed-Kelly A. Effect of smoking cessation counseling on recovery from alcoholism: findings from a randomized community intervention trial. *Addict* 1998;**93**(6):877–87.
96. Martin JE, Calfas KJ, Patten CA, Polarek M, Hofstetter CR, Noto J, et al. Prospective evaluation of three smoking interventions in 205 recovering alcoholics: one-year results of Project SCRAP-Tobacco. *JCCP* 1997;**65**(1):190–4.
97. Miller W, Rollnick S. *Motivational interviewing*. New York: Guilford; 1991.
98. Niaura R, Shadel WG. Screening and assessment. In: Abrams DB, Niaura R, Brown R, Emmons K, Goldstein MG, Monti M, editors. *Treating nicotine addiction: an evidence-based practice guide*. New York: Guilford; 2003. p. 27–72.
99. Curry SJ, Grothaus L, McBride CM. Reasons for quitting: intrinsic and extrinsic motivation for smoking cessation in a population-based sample of smokers. *Addict Behav* 1997;**22**:727–39.
100. Williams GC, Gagne M, Ryan RM, Deci EL. Facilitating autonomous motivation for smoking cessation. *Health Psychol* 2002;**21**:40–50.
101. Boardman T, Catley D, Mayo MS, Ahluwalia JS. Self-efficacy and motivation to quit during participation in a smoking cessation program. *Int J Behav Med* 2005;**12**(4):266–72.

102. Rollnick S, Mason P, Butler C. *Health behaviour change: a guide for practitioners*. London: Churchill Livingstone; 1999.
103. Curry SJ, McBride C, Grothaus L, Lando H, Pirie P. Motivation for smoking cessation among pregnant women. *Psychol Addict Behav* 2001;15:126–32.
104. <http://www.motivationalinterviewing.org>.
105. Ryan RM, Deci EL. Self-determination theory and the facilitation of intrinsic motivation, social development and well-being. *Am Psychol* 2000;55:68–78.
106. Curry SJ, Wagner EW, Grothaus L. Intrinsic and extrinsic motivation for smoking cessation. *J Consult Clin Psychol* 1990;58:310–6.
107. <http://www.surgeongeneral.gov/tobacco/5rs.htm>.
108. Chandola T, Head J, Bartley M. Socio-demographic predictors of quitting smoking: how important are household factors? *Addict* 2004;99(6):770–7.
109. West R, McEwen A, Bolling K, Owen L. Smoking cessation and smoking patterns in the general population: a 1-year follow-up. *Addict* 2001;96(6):891–902.
110. Gourlay SG, Forbes A, Marriner T, Pethica D, McNeil JJ. Prospective study of factors predicting outcome of transdermal nicotine treatment in smoking cessation. *BMJ* 1994;309:842–6.
111. Venters MH, Jacobs DR, Luepker RV, Maiman LA, Gillum RF. Spouse concordance of smoking patterns: the Minnesota heart survey. *Am J Epidemiol* 1984;120(4):608–16.
112. McBride CM, Curry SJ, Grothaus LC, Nelson JC, Lando H, Pirie PL. Partner smoking status and pregnant smoker's perceptions of support for and likelihood of smoking cessation. *Health Psychol* 1998;17(1):63–9.
113. Coppotelli HC, Orleans CT. Partner support and other determinants of smoking cessation maintenance among women. *JCCP* 1985;53(4):455–60.
114. Roski J, Schmid LA, Lando HA. Long-term associations of helpful and harmful spousal behaviors with smoking cessation. *Addict Behav* 1996;21(2):173–85.
115. May S, West R. Do social support interventions ("buddy systems") aid smoking cessation? A review. *Tob Control* 2000;9(4):415–22.
116. Monsó E, Campbell J, Tønnesen P, Gustavsson G, Morera J. Socio-demographic predictors of success in smoking intervention. *Tob Control* 2001;10:165–9.
117. Lee C, Kahende J. Factors associated with successful smoking cessation in the United States, 2000. *Am J Public Health* 2007;97:1503–9.
118. Albertsen K, Borg V, Oldenburg B. A systematic review of the impact of work environment on smoking cessation, relapse and amount smoked. *Prev Med* 2006;43:291–305.
119. Cohen S, Lichtenstein E. Perceived stress, quitting smoking, and smoking relapse. *Health Psychol* 1990;9(4):466–78.
120. Serxner S, Catalano R, Dooley D, Mishra S. Tobacco use: selection, stress, or culture? *J Occup Med* 1991;33(10):1035–9.
121. Steptoe A, Wardle J, Pollard TM, Canaan L, Davies GJ. Stress, social support and health-related behavior: a study of smoking, alcohol consumption and physical exercise. *J Psychosom Res* 1996;41(2):171–80.
122. Steptoe A, Wardle J, Lipsey Z, Mills R, Oliver G, Jarvis M, et al. A longitudinal study of work load and variations in psychological well-being, cortisol, smoking, and alcohol consumption. *Ann Behav Med* 1998;20(2):84–91.
123. Westman M, Eden D, Shirom A. Job stress, cigarette smoking and cessation: the conditioning effects of peer support. *Soc Sci Med* 1985;20(6):637–44.
124. Pucci LG, Haglund BJ. Organizational factors affecting smoking at work: results from focus group interviews with smokers and ex-smokers. *J Prim Prev* 1993;14(2):115–27.