



Nonpharmacologic Therapy for Smoking Cessation: Characteristics and Efficacy of Current Approaches

Raymond Niaura, PhD

Department of Psychiatry and Human Behavior, Butler Hospital, Providence, Rhode Island, USA

ABSTRACT

This article reviews the most common nonpharmacologic approaches used to support smoking cessation and, where possible, provides estimates of their efficacy in controlled clinical trials. Virtually all of the approaches that have been systematically evaluated to date have demonstrated modest efficacy in increasing quit rates. A cornerstone of effective treatment is tobacco dependence counseling, for which there is a dose-response relation between the intensity of counseling (total minutes of contact) and its effectiveness. New approaches in which treatment is tailored to individual patient characteristics appear promising for the future but require further study. Also, new technologies that permit delivery of smoking interventions to a wider range of patients could have a significant impact on reducing smoking prevalence worldwide in the future. Overall, the clinical literature strongly endorses combining nonpharmacologic interventions with pharmacotherapy to optimize support for smokers who are trying to quit. © 2008 Elsevier Inc. All rights reserved.

KEYWORDS: Group counseling; Individual counseling; Interactive; Internet; Smoking ban; Workplace

Despite the well-known health risks associated with smoking, the prevalence of smoking in the United States is high. Information compiled by the Centers for Disease Control and Prevention (CDC) indicated that in 2005, 20.9% of American adults, or nearly 45 million people, smoked.¹ By comparison, in 1995 the prevalence of smoking in the United States was 24.7%, or 47 million people.² Thus, although the prevalence of smoking is declining, the decrease has been very gradual.

Tobacco use is generally believed to be the most important modifiable health risk in the developed world.³ Thus, effective treatment of tobacco addiction is essential. A wide range of pharmacologic and nonpharmacologic treatments have been successfully used to assist patients in quitting smoking; the most effective approach to smoking cessation appears to result from a combination of these modalities.^{4,5}

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Requests for reprints should be addressed to Raymond Niaura, PhD, Department of Psychiatry and Human Behavior, Butler Hospital, 345 Blackstone Boulevard, Providence, Rhode Island 02906.

E-mail address: raymond_niaura@brown.edu.

Pharmacologic approaches to smoking cessation will be reviewed in a separate article of this supplement.⁶ This article reviews the most common nonpharmacologic approaches used to support smoking cessation and, where possible, provides estimates of their efficacy in controlled clinical trials.

NONPHARMACOLOGIC APPROACHES TO SMOKING CESSATION: GENERAL PRINCIPLES

Several principles must be kept in mind when considering the process of smoking cessation and interventions aimed at helping smokers to quit. First, smoking must be recast from a disorder typically treated acutely to a chronic, relapsing condition that is likely to require long-term patient management. Most smokers try to quit multiple times, and repeated intervention is necessary to support this iterative process.⁷ Second, interventions must take into account the patient's readiness to change and the fact that the patient will determine whether or not change occurs. The provision of adequate support for smokers who are motivated to quit is essential, to help smokers not only initiate the process of quitting but also to continue to follow up throughout the

process in order to maintain successful abstinence. Information resources available to help providers and patients support smoking cessation are given in **Table 1**.

SPECIFIC INTERVENTIONS

Nonpharmacologic interventions to support smoking cessation can be successfully delivered via clinical approaches and through broader public health approaches. Certain interventions such as self-help programs, telephone counseling, and cognitive-behavioral therapy are amenable to either individual delivery in the clinical setting or broad dissemination to geographic communities or workplaces. Other tactics such as public policy changes and quit contests are used specifically to target a large population of smokers at once. Thus, the following discussion is divided into clinical interventions and tactics for broad dissemination.

Clinical Approaches

Clinical approaches to smoking cessation include self-help programs, telephone counseling, cognitive-behavioral approaches such as individual and group counseling, healthcare provider interventions, and exercise programs. Key attributes of clinical interventions are summarized in **Table 2**.⁸⁻¹⁴

Self-Help Programs. Self-help programs for smoking cessation generally consist of printed or electronic materials given to patients to increase motivation to quit and provide advice on how to accomplish this goal. These programs are viewed as an important bridge between other clinical and public health approaches to smoking cessation.¹⁵ Self-help programs have several advantages: they are relatively inexpensive, the written materials provided to patients can be reused for repeated quit attempts, and the self-help materials can be customized for different target groups—in fact, smokers themselves can tailor programs to meet their own specific needs.¹⁵

The effectiveness of self-help programs for smoking cessation has been evaluated in a recent *Cochrane Review* article⁸ that included results from 11 trials (N = 13,733 patients) in which self-help programs were compared with no intervention. Results from this meta-analysis indicated that self-help programs provide a modest but significant benefit in smoking cessation (odds ratio [OR], 1.24; 95% confidence interval [CI], 1.07 to 1.45). However, no significant benefit was gained by adding self-help materials to face-to-face advice or to nicotine replacement therapy (NRT). In the same review, a meta-analysis of trial data from 20,414 patients indicated that tailoring materials to individual patients resulted in a small but significant benefit (OR, 1.42; 95% CI, 1.26 to 1.61).⁸ Similarly, another study showed that using a series of multiple printed materials tailored to baseline patient data and then retailed using 5-month interim progress data, in addition to telephone smoking cessation counseling, significantly increased 12-month cessation rates compared with single-tailored or un-tailored printed material or multiple printed material tai-

lored only to baseline data.¹⁶ Part of the benefit of tailored materials could be the result of the additional patient contact required to obtain the information necessary for customizing and/or updating individual patient materials.⁸

Telephone Counseling. Telephone counseling, a popular modality for smoking cessation treatment, consists of both reactive (in which smokers first call a hotline) and proactive (in which a counselor initiates calls to smokers) approaches. Calls may use a structured problem-solving format or provide more personal tailored feedback. The duration of telephone contacts is generally relatively short, ranging from 5 to 20 minutes.¹⁷

The effectiveness of telephone-based smoking cessation interventions was evaluated in a meta-analysis that included 27 randomized or quasi-randomized controlled trials in which proactive or reactive telephone counseling was offered to smokers and recent quitters as an aid to smoking cessation.⁹ The main outcome measure was abstinence from smoking after ≥ 6 months of follow-up. The results indicated that telephone counseling significantly increased quit rates compared with less intensive intervention (OR, 1.56; 95% CI, 1.38 to 1.77). However, no significant benefit was obtained by adding telephone support to a face-to-face intervention or NRT.⁹ In a subsequent update to that meta-analysis,¹⁸ which included 48 trials, it was shown that among smokers who initiated calls to quit lines, abstinence was improved in participants randomized to receive multiple proactive callbacks by the counselors (OR, 1.41; 95% CI, 1.27 to 1.57). Proactive counseling of those who did not initiate calls to quit lines also increased quitting compared with control (OR, 1.33; 95% CI, 1.21 to 1.47). This analysis further revealed a dose response relation: 1 or 2 calls had no significant benefit for improving quit rates, but ≥ 3 phone contacts resulted in improved odds of abstinence (OR, 1.38; 95% CI, 1.23 to 1.55).¹⁸

The results of the original meta-analysis⁹ showing that no significant benefit was achieved by adding telephone support to other interventions should be interpreted with caution, because more recent studies have shown more positive results. For example, significant short-term (3 months) benefits were observed in a study in which telephone counseling was added to NRT in low-income women.¹⁹ In another study, telephone care resulted in increased use of smoking cessation counseling programs and pharmacotherapy and also significantly improved long-term cessation rates.²⁰ Lastly, smokers in a randomized trial who had filled a prescription for smoking cessation medications were randomized to additionally receive telephone counseling or no counseling, with superior outcomes observed for telephone counseling.²¹

Cognitive-Behavioral Approaches. Nonpharmacologic therapeutic approaches that may improve smoking cessation outcomes include cognitive (e.g., learning to reduce and cope with negative mood or urge to smoke associated with

Table 1 Smoking cessation resources for healthcare providers and patients

Resource	Contact Information
American Cancer Society	www.cancer.org 1-800-ACS-2345
American Heart Association	www.americanheart.org 1-800-AHA-USA1
American Lung Association	www.lungusa.org 1-800-LUNG-USA
Association for the Treatment of Tobacco Use and Dependence	www.attud.org
Clinical Practice Guidelines: Treating Tobacco Use and Dependence	www.ahrq.gov/path/tobacco.htm
Globalink: international network for tobacco control and research	www.globalink.org
National Cancer Institute	www.cancer.gov/cancertopics/tobacco 1-800-4-CANCER
National Quitline number	1-800-QUITNOW
Nicotine Anonymous	www.nicotine-anonymous.org 1-415-750-0328
Office on Smoking and Health	www.cdc.gov/tobacco 1-800-CDC-INFO
QuitNet	www.quitnet.com
QuitSmoking Support	www.quitsmokingsupport.com
Society for Research on Nicotine and Tobacco	www.sront.org 608-443-2462
Tobacco Free Nurses	www.tobaccofreenurses.org
Treat Tobacco: database and educational resource for treatment of tobacco dependence	www.treattobacco.net
US Department of Health and Human Services stop smoking support	www.smokefree.gov

Table 2 Summary of nonpharmacologic database clinical interventions for smoking cessation

Intervention	Cochrane Database Analyses Findings for Quitting Relative to Control*	Comments
Self-help programs	Generic materials: 1.24 (1.07–1.45); Tailored materials: 1.42 (1.26–1.61) (based on 11 trials with ≥6-mo follow-up) ⁸	Self-help materials are usually more effective if tailored to the individual smoker; may be reused for multiple quit attempts
Telephone counseling	1.56 (1.38–1.77) (based on 27 trials with ≥6-mo follow-up) ⁹	May be initiated by a smoker in need of help (reactive) or by a counselor seeking to follow-up/prevent relapse (proactive); the greater the number of telephone contacts, the greater the benefit for improving abstinence. Recent studies show significant incremental benefit when used in combination with other smoking cessation interventions such as NRT
Behavioral therapy		
Individual counseling	1.56 (1.32–1.84) (based on 21 trials with ≥6-mo follow-up) ¹⁰	In general, there is a positive relation between overall number of contact minutes in counseling and odds of abstinence
Group counseling	2.17 (1.37–3.45) (based on 55 trials with ≥6-mo follow-up) ¹¹	
Healthcare provider interventions	NA	In a meta-analysis of 37 studies with a mean sample size of 507 each, ¹² physician advice had the greatest impact on increasing cessation ($P = 0.002$); healthcare teams also made a significant improvement in cessation rates ($P = 0.01$) advice from dentists and nurses had lesser, nonsignificant, effects
Exercise programs	2.36 (0.97–5.70) (based on 1 trial with 12-mo follow-up) ^{13,14}	To date, the lack of well-designed studies of exercise as a smoking cessation intervention precludes a definitive recommendation for this approach

NRT = nicotine replacement therapy.

*Values provided as odds ratios with 95% confidence intervals in parentheses.

Adapted from *Cochrane Database Syst Rev*,^{8–11,13} *Cancer Epidemiol Biomarkers Prev*,¹² and *Arch Intern Med*.¹⁴

nicotine withdrawal), behavioral (e.g., changing habits to anticipate and avoid the temptation to smoke), and motivational (e.g., listing the reasons why it is important not to smoke) therapies. Approaches such as these may involve both individual and group counseling. The US Department of Health and Human Services (DHHS) Guideline Panel on treatment of tobacco use and dependence determined that there is a strong, positive relation between the intensity of counseling (i.e., total minutes of contact) and successful abstinence.²² This is a level A finding by the panel, meaning it is based on multiple, relevant, well-designed, randomized clinical trials that yielded consistent findings.²²

Individual Counseling. Several different individual counseling approaches have been used in smoking cessation. These interventions vary substantially in both content and format.^{10,23} A meta-analysis of results from 21 trials that included >7,000 participants indicated that individual counseling significantly increased the probability of smoking cessation at follow-up (≥ 6 months after the start of counseling) compared with control (OR, 1.56; 95% CI, 1.32 to 1.84). However, in this meta-analysis, unlike the findings of the DHHS guidelines, there was no significant benefit gained with intensive counseling compared with brief counseling.¹⁰

Group Counseling. Group counseling, like individual interventions, may use ≥ 1 of many different models (e.g., education, advice, or support to prevent relapse).¹¹ The effectiveness of these approaches for smoking cessation has been evaluated in a meta-analysis that included results from 55 trials.¹¹ The analysis indicated that group therapy significantly improved the probability of smoking cessation during the follow-up period (≥ 6 months from the start of the group program) when compared with no intervention (OR, 2.17; 95% CI, 1.37 to 3.45) or self-help intervention (OR, 2.04; 95% CI, 1.60 to 2.60), but there was no evidence that group therapy was more effective than individual counseling.¹¹ The results from this analysis differ somewhat from those in another recent evaluation of different approaches to smoking cessation counseling. Judge and colleagues evaluated results from 6,959 recipients of smoking cessation services in the United Kingdom and concluded that individuals who participated in group counseling were significantly more likely to quit for ≥ 4 weeks than were those who underwent individual counseling (OR, 1.38; 95% CI, 1.09 to 1.76).²⁴ However, a self-selection bias could not be ruled out in this observational study.

Healthcare Provider Interventions. Opportunistic interventions by healthcare providers have the potential to significantly reduce the prevalence of smoking.²⁵ These interventions include brief advice during routine patient contact, implementation of guideline-based screening and treatment programs for patients who smoke, and recommendation of exercise programs as an adjunct to smoking cessation interventions.

Physicians, nurses, pharmacists, and other healthcare providers all have the potential to lead successful smoking cessation interventions.^{26–28} Primary care practitioners are ideally positioned to intervene with their patients who smoke, and current guidelines strongly support such action.¹² Results from a meta-analysis of 37 studies of smoking cessation counseling by physicians, nurses, dentists, or provider teams indicated that receiving advice from any healthcare professional significantly increased quit rates.¹² Physicians were most effective, followed by multiprovider teams, dentists, and nurses.¹² It has been estimated that opportunistic interventions by primary care physicians in the United States could lead to smoking cessation in nearly 2 million patients each year.²⁵ Limited results also suggest that trained community pharmacists who provide counseling and record-keeping support for their customers also may have a positive effect on smoking cessation rates.²⁹

In addition to providing intratreatment support for patients who smoke, healthcare professionals should encourage patients attempting to quit smoking to seek out extratreatment support. Analyses of 19 pooled studies suggest that such extratreatment support may benefit positively a smoker attempting to quit compared with patients receiving no social support (OR, 1.5; 95% CI, 1.1 to 2.1).²² Physicians may facilitate extratreatment assistance for their patients by encouraging these patients to seek out extratreatment programs to quit smoking, helping in training these patients in how to seek such help, and arranging outside support for the smoker.²²

Exercise Programs. A recent *Cochrane Review* article¹³ examining the impact of exercise-based interventions alone or in combination with smoking cessation programs found several randomized studies that demonstrated significantly improved abstinence at the end of treatment and 3-month follow-up; however, only 1 study, which was carried out exclusively in women, demonstrated significant longer-term benefits. In this study by Marcus and colleagues,¹⁴ 281 female smokers were randomly assigned to either a cognitive-behavioral smoking cessation program combined with 3 supervised vigorous exercise sessions per week, or to the cessation program and 3 health education lectures per week but no exercise. Participants in the exercise group demonstrated significantly higher continuous abstinence rates when compared with control subjects at end of treatment (12 weeks) (19.4% vs. 10.2%; $P = 0.03$), at 3 months (16.4% vs. 8.2%; $P = 0.03$), and at 1 year (11.9% vs. 5.4%; $P = 0.05$).¹⁴ Apart from this study, the *Cochrane Review* indicated that most available trials were either too small to offer conclusive evidence in support of exercise as an effective intervention, or included an exercise intervention of insufficient intensity to achieve the desired results.¹³ Thus, although the study by Marcus and colleagues¹⁴ suggests that the use of exercise may be a promising smoking cessation intervention, additional well-designed trials are needed to offer more conclusive recommendations.

Table 3 Summary of nonpharmacologic public health interventions for smoking cessation

Intervention	Efficacy Findings	Comments
Community-level interventions	The COMMIT trial ³⁰ demonstrated modestly higher odds of quitting only in light smokers (<25 cigarettes/day) in an intervention community compared with a control community (OR, 1.17; $P < 0.05$)	Abstinence rates are significantly higher in communities with aggressive state programs for tobacco control, such as media campaigns, cigarette excise taxes, and public smoking restrictions ³⁰
Workplace interventions	A Cochrane Database analysis of controlled studies demonstrated that healthcare professional advice and individual or group counseling delivered in the workplace all increased the odds of quitting ³¹ A second meta-analysis of 19 studies demonstrated significantly improved odds of abstinence at 6 and 12 mo, but not thereafter ³²	Workplace tobacco bans decrease cigarette consumption during work hours but are less effective in decreasing overall prevalence of smoking; workplace competitions and incentives have shown little efficacy in improving long-term abstinence ³¹
Multimedia campaigns	A large-scale campaign in rural New York that used education, referrals, school-based programs, and poster contests resulted in an absolute decrease in smoking prevalence of 10% over the 5-yr study period ³³	Multimedia interventions involve a variety of media to broadcast smoking cessation messages, including radio, newspaper, billboard, and television advertising; telephone contacts; workplace and community postings; professional education; and brochures
Public smoking bans	A ban of all public smoking in Italy resulted in a 2.3% decrease in smoking prevalence <1 yr later ⁴	Workplace smoking bans alone do not consistently lower overall smoking prevalence, but have been shown to increase the overall success of employer-provided smoking cessation programs ³⁵

COMMIT = Community Intervention Trial for Smoking Cessation; OR = odds ratio.

Adapted from *Am J Health Promot*,³⁰ *Cochrane Database Syst Rev*,³¹ *Tob Control*,³² *Scand J Public Health Suppl*,³³ *Ann Oncol*,³⁴ and *Am J Ind Med*.³⁵

Broad Dissemination/Public Health Approaches

Broad dissemination programs include community-level interventions, workplace interventions, multimedia interventions, and public policy changes. These programs often use the approaches discussed previously (e.g., self-help materials, counseling, and healthcare provider interventions), but are conducted on a larger scale and are coordinated to target a broad audience at once. Key aspects of public health interventions are summarized in **Table 3**.^{30–35}

Community-Level Interventions. Community-based approaches have been used extensively to support smoking cessation and have resulted in varied improvements in quit rates.^{36–38} These interventions have used many different approaches, including distribution of self-help materials (e.g., “quit kits”), support groups, individual counseling, telephone quit lines, quit contests, advocacy for smoke-free worksites and schools, and bans on cigarette vending machines.³⁹

The Community Intervention Trial for Smoking Cessation (COMMIT) was a randomized community-based smoking-cessation program carried out over 5 years. The most recent analysis of results from COMMIT indicates that during the period when the study was funded (1988 to

1993), quit rates in the COMMIT intervention communities were higher than those in control communities for patients who smoked <25 cigarettes per day; these participants in the COMMIT communities were 1.17 times more likely to quit than were similar participants in other communities ($P < 0.05$).³⁰ However, in 2001, 8 years after funding was stopped, there was no difference between quit rates in the COMMIT and comparison communities for this group of patients. Among heavier smokers (≥ 25 cigarettes per day), there was no difference in quit rates during either time frame. Quit rates were significantly higher in communities with aggressive state programs for tobacco control, such as antismoking media campaigns funded by cigarette excise taxes and restrictions on smoking in public environments (e.g., California, Massachusetts), than in communities without such measures (e.g., Iowa, New Mexico, North Carolina).³⁰

Communitywide smoking cessation contests (e.g., “Quit and Win”)—which are designed to raise community awareness of smoking hazards in addition to helping cigarette smokers achieve abstinence—have yielded modest improvements in smoking cessation rates. One study, in which participants were provided with self-help materials and were encouraged to use other smoking cessation methods of their choice, such as pharmacologic aids and/or behavioral therapy, demonstrated an 11% abstinence rate at 1-year

follow-up.³⁸ Whereas other studies have demonstrated similar efficacy among contest participants (8% to 20% abstinence at 1-year follow-up), the effect of such contests on communitywide prevalence of smoking is negligible (on average, only 0.2% of smokers in any community quit because of the contests).⁴⁰ Also, these contests are subject to various levels of deception among contestants that could compromise the validity of the results.⁴⁰

Workplace Interventions. The workplace is a setting in which large groups of people can be reached simultaneously to encourage smoking cessation. A wide range of interventions has been used, including seminars, online intranet interventions, and advice from occupational physicians.⁴¹⁻⁴³

The effectiveness of workplace-based smoking cessation interventions has been evaluated in 2 recent reviews. Moher and colleagues³¹ reviewed a number of controlled trials of workplace interventions that used either interventions aimed at the individual (e.g. counseling, self-help materials, or NRT) or interventions targeted to the workplace as a whole (e.g. tobacco bans, social support, environmental support, or incentives). Results showed that advice from a healthcare professional, individual or group counseling, and NRT all increased the likelihood of successful abstinence; self-help interventions were less effective. Although tobacco bans appeared to decrease cigarette consumption during work hours and reduce secondhand smoke exposure of nonsmoking personnel, their effect on smoking prevalence was less certain. Finally, whereas competitions and incentives increased smoking cessation attempts, there was no evidence that they increased abstinence rates.³¹

The second meta-analysis, which included results from 19 studies (9,578 subjects) published between 1989 and 2001, indicated that workplace-based interventions similar to those mentioned previously resulted in significant improvements in quit rates at 6 months (OR, 2.03; 95% CI, 1.42 to 2.90) and 12 months (OR, 1.56; 95% CI, 1.17 to 2.07), but not at longer intervals after the intervention.³²

Multimedia Interventions. Multimedia interventions to aid patients with smoking cessation are becoming increasingly common. Results from a large-scale multimedia intervention aimed at decreasing cardiovascular disease risk resulted in an impressive increase in smoking cessation.³³ This 5-year intervention program targeted smoking cessation as well as general health interventions in a population of 158,000 patients in rural New York. The smoking cessation interventions included smoking cessation education and referrals, school-based smoking cessation programs, and home poster contests. These were achieved via radio and newspaper advertising, brochures, workplace and community postings, and professional education. A comparison of results from surveys carried out at the beginning of the program in 1989 and again during the study in 1994 to 1995 indicated that during this period, smoking prevalence declined from 27.9% to 17.6% in the intervention population.³³

Positive results were also obtained in a Texas media campaign that combined outreach programs for adults who were attempting to quit with television, radio, newspaper, and billboard advertisements promoting these programs as well as a telephone counseling service. Results from this study indicated that 2% of 622 daily smokers quit completely, and an additional 5.2% reported that they were no longer smoking every day.⁴⁴

Public Policy Changes. The most important and potentially consequential public policy changes are smoking bans. Although only a handful of studies have evaluated the effects of smoking bans on cessation rates, evidence suggests such bans may significantly increase quitting. The Italian government banned smoking in all indoor public places in January 2005, resulting in an overall 8.9% decline in cigarette sales and a 2.3% decline in smoking prevalence.³⁴ In another study, an 8-week smoking ban resulted in short-term changes in the behavior of 5,503 female naval recruits.⁴⁵ At entry into this study, 41.4% of these recruits were smokers, but as a result of the ban, self-reported smoking prevalence declined significantly, to 25% ($P < 0.001$). However, 3 months after the end of the ban, 89% of daily smokers and 31% of occasional smokers had relapsed.⁴⁵

The combination of a workplace smoking ban with an individual smoking intervention (hypnotherapy) resulted in an abstinence rate of 15% at 12 months in 2,642 workers in the United States.⁴⁶ Another, more recent study of 128 smokers indicated that combining a smoking cessation program with the institution of a smoke-free workplace resulted in a higher quit rate at 6 months compared with the smoking cessation program alone (52.4% vs. 43.0%).³⁵ In addition, those who quit after the smoking ban was initiated were significantly more likely to be abstinent at 6 months ($P = 0.03$) and were 80% less likely to relapse than were those who quit before the ban.³⁵

NEW APPROACHES: TAILORED INTERVENTIONS

A variety of novel nonpharmacologic approaches have attempted to tailor smoking cessation interventions to patient characteristics and needs. These approaches involve creating individualized programs based on information collected from the patient and often use new technologies to facilitate delivery. The availability of computer technology has facilitated the growth of individualized programs and has also made this process less expensive.⁴⁷

Treatment Matching

Treatment matching can be applied to both pharmacologic and nonpharmacologic interventions and involves specialized assessments of individual and environmental attributes that may be associated with cessation outcome. These assessments may take the form of questionnaires, clinical interviews, or measurement of physiologic indices such as carbon monoxide, serum nicotine/cotinine levels, or pulmonary function.²² The objective of treatment matching is to

assign patients to treatments that are the most appropriate for their individual characteristics (and, thus, most likely to be successful), thereby reducing the likelihood of treatment failure. With respect to nonpharmacologic approaches, matching treatment to the patient's level of motivation to quit has demonstrated some success.⁴⁸

Stepped-Care Interventions

Stepped-care interventions refer to the practice of initiating treatment with a low-intensity intervention and then using successively more intense interventions in patients who fail lower intensity treatment. Such an approach often involves treatment matching and is suggested as a way to allocate smoking cessation treatments in a cost-effective manner.⁴⁹ One of the valuable aspects of this approach is that it inherently addresses treatment failures, which is important because nicotine addiction is a chronic disease that is highly subject to relapse and often requires multiple interventions. Unfortunately, few data are available on the efficacy of stepped-care models for smoking cessation. In 1 study, this approach had short-term efficacy in smokers with coronary heart disease (over a 3-month follow-up period, abstinence increased from 42% to 53%; $P = 0.05$), but yielded no significant benefit when compared with minimal intervention over longer-term follow-up at 1 year.⁵⁰ Further research into this approach is needed.

Computer and Information Technologies

Internet-based smoking cessation programs have the potential to reach and treat a large population of smokers. However, the key to efficacy of this approach largely depends on the quality of the interventions offered in this way. Recently, a group of investigators used DHHS national guidelines²² to assess the quality and usability of Internet-based programs.⁵¹ This group found overall dismal results. Although Web sites were usually well organized, the reading level was often too high for the average user. Also, the vast majority (80%) of Web sites did not include ≥ 1 of the key components of practice guidelines, despite the fact that many of the omitted components were those most applicable to the interactive capabilities of the Internet.⁵¹

Recently a short-term evaluation was conducted of an Internet-based program that included social support and cognitive-behavioral coping skills modules designed specifically for the multimedia capabilities of the Internet.⁵² The cessation rate (defined as abstinence for the preceding 7 days) at 3 months was 18%.⁵²

There is evidence that the combination of clinician advice, an interactive computer program, and motivational counseling during routine medical visits increases reported smoking abstinence in teenagers.⁵³ In this study, the intervention was individually tailored to each subject's smoking status and stage of change and included a 30-second clinician advice message, a 10-minute interactive computer program, a 5-minute motivational interview, and up to two 10-minute in-person or telephone sessions. The control in-

tervention was a 5-minute motivational session to promote increased consumption of fruit and vegetables in nonsmokers. The intervention increased the smoking cessation rate after 2 years among self-described smokers (OR, 2.42; 95% CI, 1.40 to 4.16). The control intervention had no significant effect.⁵³

Personal digital assistants and mobile phones may be useful for providing reminders about smoking cessation interventions and as a convenient and portable storage location for key content to be delivered to patients. In a randomized trial of approximately 1,700 smokers in New Zealand, a personalized, telephone text messaging intervention produced greater short-term (6 weeks) cessation compared with a control group (28% vs. 13%, $P < 0.0001$).⁵⁴ However, the feasibility of use of these instruments in the primary care setting remains to be determined.⁵⁵

Interactive voice response (IVR) technology has also demonstrated promise as part of smoking cessation interventions. In 1 study, telephone-based IVR was used to deliver an automated tobacco-use question set to identify current smokers prior to scheduled primary care visits at 2 inner-city clinics.⁵⁶ Computer-generated reminders that incorporated information obtained from the automated calls were made available for physicians at the time of the patient visit. As a result of having this information readily available, 58 of the 120 participating smokers reported that they discussed smoking cessation with their provider during their visit. Furthermore, 71% of participants agreed that the IVR system was a useful means of providing health information to their physicians. Automated capture of patient-reported data via IVR technology is a potentially useful strategy for tobacco-use screening in primary care.⁵⁶

COMBINATION USE OF NONPHARMACOLOGIC AND PHARMACOLOGIC INTERVENTIONS

Although nonpharmacologic interventions alone can significantly improve cessation rates in smokers attempting to quit, research shows that a multimodal approach combining nonpharmacologic methods with medication is necessary to optimize cessation rates.²² For instance, when combined with behavioral interventions—as recommended by DHHS guidelines²²—both first- and second-line agents significantly increase continuous abstinence rates.^{5,57,58} The greatest increases in abstinence rates occur when multiple concomitant smoking cessation agents are combined with behavioral treatment over an extended period.^{59,60} It has been suggested that pharmacologic and nonpharmacologic approaches may potentiate the efficacy of one another through various means; for example, (1) complementary mechanisms of action (e.g., behavioral therapy improves skills necessary to achieve and sustain abstinence, while pharmacotherapy reduces withdrawal symptoms); (2) pharmacotherapy enables patients to overcome the acute phase of quitting when withdrawal symptoms are most intense, while behavioral therapy provides coping mechanisms to

maintain long-term abstinence; and (3) one treatment may improve compliance with the other.⁶¹

SUMMARY

Nonpharmacologic interventions have been used effectively and extensively to support patients who are attempting to quit smoking. Virtually all of the approaches that have been systematically evaluated to date have demonstrated efficacy in increasing quit rates. Combinations of interventions (e.g., smoking bans plus individual counseling) appear more effective than single approaches, and the combination of pharmacotherapy plus nonpharmacologic intervention also has been shown to be more effective than either method alone. New technologies may permit inexpensive delivery of smoking interventions to a larger number of patients, hopefully leading to improved abstinence rates in the future.

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