Special Series

Benefits of Stopping Smoking

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This article launches a special WESTERN JOURNAL OF MEDICINE *effort to help prevent disease and disability. Erica Frank, MD, MPH, an Assistant Professor in the Department of Community and Preventive Medicine and Department of Medicine, Emory University School of Medicine, and Adjunct Professor at the Emory University School of Public Health, Atlanta, Georgia, will head the endeavor. The goals are to present scientific foundations for prevention and to provide practical ways to improve patients' lives. This first article addresses smoking cessation. We may think that we know it all, but we may not, and patients do not: about 25% of Americans smoke, and more than half of persons who ever smoked began their fatal habit before they were 18 years old. Side-stream smoke affects adults and children adversely, too, causing inflammation, infection, and cancer. Smokers need to stop smoking, and young people need to not start. Dr Frank's review is accompanied by a page for patients. It debunks myths and is designed to be duplicated so patients can leave their physician's office with a new lease on life in hand. Look for future prevention-oriented articles in this series that feature science and patient education.*

LINDA HAWES CLEVER, MD
Editor

Although physicians can easily list illnesses attributable to smoking, it may be more difficult to describe specific benefits of stopping smoking. I will summarize the known health benefits that follow the cessation of smoking. The companion patient information sheet should help stimulate discussions with patients about issues related to smoking cessation.

Highlights

- For those who quit smoking at age 35, it is estimated that women add about 3 years to their life expectancy and that men add more than 2 years.
- Smokers are at least twice—and as much as 6 times—as likely to have a myocardial infarction as are nonsmokers; those who stop smoking for 2 years have about twice the risk of having a myocardial infarction as never-smokers; and, after stopping for more than 2 to 4 years, their risk is not significantly different from that of those who have never smoked.
- About 53,000 persons die each year in the United States of the effects of the passive inhalation of tobacco smoke. This estimate includes about 37,000 deaths from heart disease and 3,800 deaths from lung cancer.
- Although 79% of smokers gain weight after quitting smoking, they gain an average of only 2.3 kg (5 lb).

The benefits of stopping smoking are substantial and compelling. The 1990 Surgeon General's report reasserted that smoking cessation is both desirable and achievable.[1] Although cigarettes are responsible for one of every six deaths in the United States (approximately 1,000 deaths per day), it is encouraging that more than 38 million Americans have voluntarily quit smoking.

Morbidity and Mortality

A number of large studies have documented reductions in overall mortality following smoking cessation. The Coronary Heart Disease Policy Model projected that 35-year-old men would live 2.3 years longer if they quit smoking and that 35-year-old women would gain 2.8 years.[2] Mattson and colleagues found that a smoking-related disease will kill 16% of heavy smokers by age 65, 28% by age 74, and 36% by age 84.[3] The Coronary Artery Surgery Study found that in 1,893 men and women aged 55 years and older, the relative risk of death for smokers versus that for former smokers was 1.7[4]; the US Veterans Affairs study (n = 293,958 men) found a relative risk of 1.4[5]; and Friedman and colleagues reported, after adjusting for baseline differences, a relative mortality risk of 1.6 in 25,917 men and women.[6]

For both men and women, the relative risk of death for smokers versus that for never-smokers ranges between 1.5 and 2.5, with men at higher risk than women and a dose-response by number of cigarettes per day. The risk declines to 1.5 to 2.0 times that for never-smokers by 5 years of abstinence from cigarettes and, in many studies, to equivalence with never-smokers after 15 years, particularly for those who smoked less than a pack per day.[1]

The dose response of smoking across disease processes is both marked and consistent, at least in men. Those who smoke fewer cigarettes a day have lower relative risks of death from all causes, all cardiovascular diseases, coronary heart disease, stroke, influenza and pneumonia, aortic aneurysm, all respiratory diseases,

(Frank E: Benefits of stopping smoking. West J Med 1993; 159:83-87)

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This work was supported by institutional National Research Award No. 5T32 HL07034 from the National Heart, Lung and Blood Institute to Stephen P. Fortmann, MD, Deputy Director, Stanford Center for Research in Disease Prevention.

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bronchitis and emphysema, all cancers, and lung cancer than do those who smoke more.[1,5]

Risk tends to diminish in relation to years of cigarette abstinence, best shown for all-cause mortality and total cardiovascular disease-related mortality.[5] Smoking cessation's effect on overall morbidity is more difficult to document, as indices of health vary among studies, and most studies fail to identify those smokers who quit because of ill health.[1]

Pulmonary Disease

Improvements in the rates of both malignant and nonmalignant pulmonary diseases and in risks for those diseases are substantial with smoking cessation. Cigarette smoking is the major cause of chronic obstructive pulmonary disease in Americans, accounting for approximately 84% of deaths among men and 79% among women due to this disease.

Former smokers are less likely than are current smokers to have chronic coughs. Six studies cited in the Surgeon General's report found in men a range for prevalence of cough of at least three months per year of 13% to 41% for current smokers, 2.9% to 13.0% for ex-smokers, and 0.0% to 11.0% for never-smokers. Three studies in the same report found a range for women of 9.1% to 31.8% for current smokers, 7.5% to 10.0% for ex-smokers, and 4.0% to 5.6% for never-smokers.[1] A prospective study found a decrease in the prevalence of chronic cough from 11.2% to 1.8% in 623 white men who had smoked at least a pack per day and then had quit.[7]

Ex-smokers have less phlegm production and wheezing, higher forced expiratory volume in one second and vital capacity, less small airway disease and bronchial reactivity, better immune function, and lower mortality from influenza and pneumonia, pulmonary tuberculosis, bronchitis and emphysema, or asthma than do current smokers.[1,5,8] Although some pulmonary damage is irreversible, many pulmonary risks begin to decrease within a few weeks to months of abstinence from smoking.[1]

Smoking cessation clearly decreases the risk of lung cancer. The disadvantages of continued smoking begin at a cellular level, before the onset of disease. Smokers are more likely to have atypical cells in their bronchial epithelia than are ex-smokers or never-smokers—93.2% of smokers, 6.0% of ex-smokers, and 1.2% of never-smokers have such cells—and are more likely to have DNA damage.[1] Smokers are more likely than are ex-smokers or never-smokers to have pulmonary epithelial, possibly precancerous, lesions.[9] Continued smoking may adversely affect the prognosis for lung cancer. In a study of 112 patients treated for small-cell lung cancer, those who had stopped smoking before their diagnosis had the best survival rates, those who stopped at the time of the diagnosis had the next best rates, and those who continued smoking had the worst.[10]

The incidence of lung cancer is reduced 80% to 90% in ex-smokers abstinent for 15 years or more.[1] Of the 12,866 men participating in the Multiple Risk Factor Intervention Trial, no man who never smoked died of lung cancer; the rate per 1,000 person-years was 0.43 for ex-smokers, 0.22 for those who smoked 1 to 19 cigarettes a day, 1.29 for 20 to 39 cigarettes a day, and 1.45 for 40 or more cigarettes a day.[11] When compared with never-smokers, smokers in the US veterans study had a relative risk of lung or bronchial cancer of 11.3, and ex-smokers' relative risk was 4.0.[5] As with many other disease processes in both women and men, those who had previously smoked fewer cigarettes a day, had been abstinent longer, or had stopped for reasons other than illness had generally lower risks.[1,5]

Cardiac Disease

The incidence of cardiac disease and death from coronary heart disease is greatly reduced in those who stop smoking, as reviewed extensively elsewhere.[12] The longer the duration of ex-smoking, the lower the risk of myocardial infarction (MI). In one study of 4,648 men, the age-adjusted relative risk of MI for current smokers versus never-smokers was 2.9; those who had abstained 1 to 2 years had a relative risk of 2.0 when compared with never-smokers; and the relative risk for those who had abstained longer than two years did not differ significantly from that for those who had never smoked ($P \geq .05$), becoming virtually the same as never-smokers' risk by 10 to 20 years of abstinence.[13] Similarly, Rosenberg and colleagues, in their study of 3,285 women, reported that the age-adjusted relative risk of MI for current smokers versus never-smokers was 3.6, that those who had abstained 1 to 23 months had a relative risk of 2.6, and that the relative risk for those who had abstained for longer than 2 to 4 years did not differ significantly from that for those who had never smoked ($P \geq .05$).[14] Those who continue to smoke are clearly at greater risk of MI or death; in the Coronary Artery Surgery Study, smokers had 1.5 times the risk of MI or death that those who quit did (95% confidence interval 1.2 to 1.7).[4]

The risk of death also decreases for those who quit smoking after an MI. The Framingham Study investigators found that the estimated six-year mortality rate was 18.8% for those who quit smoking after their first MI and 30.4% for those who continued.[15] Mulcahy and co-workers reported a five-year mortality of 14.6% for those who stopped smoking following an MI, 14.2% for those who reduced cigarette use, and 28.8% for those who continued their previous levels of use.[16] Goldberg and colleagues found 1-, 5-, and 10-year postmyocardial infarction survival rates of 99%, 97%, and 95% for those who quit smoking and 98%, 84%, and 51% for those who did not.[17]

Vascular Diseases

The risk of stroke for current smokers has been calculated to be 1.5 times that for those who never smoked, with the risk among ex-smokers dropping to 1.2 compared with that for never-smokers. These estimates are based on a meta-analysis of 32 studies.[18] Data also suggest that those who have smoked fewer cigarettes per day and those who have had a longer duration of abstinence from cigarettes are at lower risk for stroke, although the

rate at and the extent to which risk declines are uncertain.[1,5,19,20]

The risk of death from ruptured aortic aneurysm in those who quit smoking appears to be two to three times that in persons who have never smoked but only about half that in those who continue to smoke.[1,5] Former smokers have about half the risk of claudication and peripheral arterial disease as current smokers.[1]

Diseases of Other Organ Systems

In addition to the well-documented benefits of smoking cessation on pulmonary and cardiovascular disease, there is abundant evidence of the value for other organ systems as well. Smoking cessation decreases the risks of peptic ulcer disease, oral, esophageal, bladder, cervical, laryngeal, and pancreatic cancers, and the risk of death from all these diseases.[1,5] Substantial evidence exists that smokers have worse reproductive outcomes, higher risks of osteoporosis, earlier menopause (and hence an increased risk of coronary heart disease in women), more wrinkling,[1] and a higher risk of cataracts[21,22] than do nonsmokers, though there is little direct evidence of the effect of stopping smoking on these outcomes.

Patients often believe that they are merely trading off one disease process for another—that if they do not die of heart disease, they will die of cancer. While this is obviously ultimately true, death is delayed and cancer risk decreased by stopping smoking. In a study by La Croix and co-workers, men who were former smokers had a relative risk for all cancers of 1.7 versus current smokers' relative risk of 2.4; the risk for women who formerly smoked was 1.0 versus current smokers' risk of 2.4.[23]

Additional Risk Factors

Many studies have shown that people often pick clusters of good or poor health habits, although the reason for this is difficult to determine.[1,24] Surveys have shown that former smokers drink alcohol less than do current smokers and more than do those who have never smoked.[1] Two large US studies, the National Health Interview Survey and the Behavioral Risk Factor Surveillance System, have suggested that lack of exercise and smoking may cluster together, as former smokers are less likely to exercise than are those who have never smoked but are more likely to exercise than are current smokers.[1,24]

Substantial evidence exists that smoking adversely affects plasma cholesterol levels.[1,25] The data are strongest for cigarettes' deleterious effect on high-density lipoprotein levels; this has been repeatedly demonstrated in both men[26-29] and women,[27,29,30] and smoking cessation has been shown to lower these levels.[30,31] There is also evidence that smoking adversely affects low-density lipoprotein, very-low-density lipoprotein,[1,26] and triglyceride levels.[26,32] There is direct evidence that smoking cessation improves total cholesterol levels in both men and women.[7,33]

An increase in body weight is the one major health determinant that tends to change in an unhealthy direction after smoking cessation. Smokers tend to weigh less than nonsmokers and to gain weight when they quit smoking.[1,31] The Surgeon General's report summarized 15 prospective studies on smoking and body weight.[1] With a total sample size of 20,217 and a median follow-up of two years, the average weight gain among quitters was 2.1 kg (4.6 lb) versus 0.4 kg (0.8 lb) for continuing smokers. Of those quitting smoking, 79% gained weight versus 56% of continuing smokers. Only 20.3% of quitters versus 10.8% of continuing smokers gained more than 4.5 kg (10 lb), and less than 4% of men or women who quit gained more than 9 kg. Weight gain is probably attributable to a combination of changed food tastes, increased food consumption, and a decreased metabolic rate.[1,12] Much of this weight gain can be avoided through changes in diet and exercise and possibly through the use of nicotine gum—the role of nicotine patches has not yet been tested (see the "Page for Patients" titled "Stopping Smoking: Myths and Reality" at the end of this article). The enormously decreased health risks that occur with smoking cessation eclipse any cessation-induced health risks due to weight gain, however.

Further Effects of Smoking

Often one of the most compelling arguments for a patient to stop smoking is that it is harming others. In the United States about 53,000 persons die each year of passive exposure to tobacco smoke; this includes about 37,000 deaths from heart disease and 3,800 deaths from lung cancer.[34] Most studies have estimated that nonsmoking wives of smokers have an all-cancer risk (as well as a lung cancer risk) that is about 1½ times that of nonsmoking wives with nonsmoking husbands, with a dose-response by number of cigarettes passively inhaled per day.[34,35] Smokers' wives also have an increased incidence of pulmonary epithelial, possibly precancerous, lesions.[9]

Although other cancer risks, in addition to those of lung cancer, that are associated with main-stream smoke also seem to be elevated in those with exposure to side-stream smoke (cancers of the cervix or paranasal sinuses), there may also be some disease risks that are specific to side-stream smoke. It has been speculated that this may be the case for brain and breast cancers in women with exposure to spouses' cigarette smoke and for childhood brain tumors and leukemias associated with parental smoking.[35] Whereas the biologic plausibility of this is unclear, some carcinogenic and other toxic compounds may be present in even higher concentrations in side-stream smoke than in actively inhaled main-stream smoke: particulate matter, nicotine, carbon monoxide, and *N*-nitrosamines, for example.[35]

The pathogenesis of the 37,000 heart disease deaths from passive smoking is also complex. Environmental tobacco smoke may increase platelet adhesion and aggregation and may injure arterial endothelium, all contributing to atherosclerotic plaque formation. Those persons with exposure to side-stream smoke show decreased exertional work capacities and lower chronotropic capacity in response to exercise, and those with preexisting heart disease may even have angina.[34]

Children of smokers are at increased risk for chronic cough and acute respiratory illnesses, for hospital admittance for those illnesses, and for middle ear infections.[35]

Smoking also harms others in less direct ways. In addition to noneconomic costs, the fiscal costs of smoking-attributable fires are about $409 to $616 million a year.[36] Smoking-attributable fires cost employers an estimated $5 to $10 per smoking employee per year. This is, of course, a small portion of the $336 to $601 excess dollars per year that the average smoker costs an employer, $75 to $150 of which is in direct health care costs, $17 to $34 in workers' compensation, $20 to $33 in life insurance, and $40 to $80 in absenteeism.[36]

Other Licit Smoking

In a large (n = 293,958) study of US veterans, cigarette smokers had a relative total mortality of 1.9 compared with those who never smoked; cigar smokers' relative mortality was 1.2 when compared with never-smokers, and for pipe smokers it was 1.1.[5] Risks of death from cardiovascular disease were 1.7 for cigarette smokers, 1.1 for cigar smokers, and 1.0 for pipe smokers; mortality risk from all cancers was 2.2, 1.3, and 1.3, respectively; risk from all respiratory diseases was 4.8, 0.8, and 1.4; and from lung cancer, the risk was 12.1, 1.7, and 2.1.[5] Limited data from this and other studies suggest that mortality from specific diseases such as smoking-related cancers does decrease when persons stop smoking pipes and cigars.[1,5]

Conclusion

The benefits of smoking cessation are unquestionable and have been demonstrated in populations of all ages, in both sexes, in well populations, and in those who have already had a myocardial infarction or have lung cancer. Physicians must become even more active and assertive in recommending smoking cessation to all patients. Less than half of smokers surveyed in two California cities said that they have ever been told to stop smoking by a physician,[37] and similar data have been found elsewhere in the United States.[38] Multiple resources are available to help physicians counsel patients about smoking cessation, such as "The American Academy of Family Physicians' Stop Smoking Kit" (8880 Ward Parkway, Kansas City, MO 64114, [816] 333-9700) and the National Institutes of Health "Clinical Opportunities for Smoking Intervention: A Guide for the Busy Physician."[39] Doing so is every physician's responsibility.

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