Smoking cessation and secondary stroke prevention

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The ≈7 million adult stroke survivors in the United States remain at high risk for a recurrent stroke. The increased morbidity and cost associated with recurrent stroke, in addition to the 5% to 20% yearly stroke recurrence, support the need for additional investigations into secondary stroke prevention.[1,2] Stroke prevention guidelines, whether primary or secondary, focus on risk factor control of modifiable risk factors. The American Heart Association/American Stroke Association guidelines for secondary stroke prevention indicate evidence-based risk factor control, interventional approaches, and treatment options as approaches to secondary stroke prevention.[1] Risk factor control for secondary stroke prevention includes managing hypertension, diabetes mellitus, and hyperlipidemia, as well as lifestyle modifications, including weight management, alcohol consumption, and smoking cessation.[3] A cornerstone of recurrent stroke reduction, and lifetime cardiovascular disease (CVD) risk, is modification of lifestyle behaviors such as abstaining from tobacco, adopting a healthy diet, and exercising regularly. While these healthy lifestyle behaviors should start in childhood and continue through one's lifetime, modifying these health behaviors after a stroke can reduce the risk of recurrent stroke and other CVD-related illnesses.[3]

Smoking alone may contribute to nearly 15% of all stroke deaths per year, and smoking cessation rapidly reduces the risk of stroke and other CVD-related illnesses, with the risk almost disappearing within 4 years of smoking cessation.[4–8] The American Heart Association/American Stroke Association secondary stroke prevention guidelines list smoking cessation as a Class 1 level of evidence recommendation for stroke prevention but are based on limited populations.[1] In this issue of *Neurology*®, Epstein et al.[9] investigated the association between smoking cessation and adverse outcomes after an ischemic stroke. This study used data from the Insulin Resistance Intervention After Stroke (IRIS) study, a randomized trial of 3876 insulin-resistant, nondiabetic ischemic stroke patients from 179 research sites in 7 countries with a median follow-up of 4.8 years. Participants who quit smoking had a lower risk of the combined outcome of death, recurrent stroke, and myocardial infarction (MI). While there was a drastic reduction in the risk of the combined outcome, the reduction in recurrent stroke risk or MI risk individually was not statistically significant. The reduction in risk occurred early and remained for up to 5 years for the people who quit smoking. While the results of this study seem intuitive and known, few studies have assessed the relationship between smoking cessation and recurrent stroke risk.

The researchers compared the prevalence of other secondary stroke prevention measures between those who quit smoking and those who did not quit smoking. The participants who quit smoking were only slightly more likely to achieve other preventive health goals, including blood pressure management, antithrombotic use, and statin use, introducing the possibility of prevention bias. Prevention bias is a concept whereby patients who make 1 healthy choice are more likely to make additional healthy choices. While this is a possibility, the difference between the 2 groups with regard to secondary stroke prevention measures other than smoking cessation is fairly comparable, with no more than a 5% absolute difference between groups. The estimates for reduction in death/stroke/MI for those who stop smoking after an ischemic stroke support the need for more targeted interventions for smoking cessation. Prevention efforts can be addressed through both public health interventions and individually tailored interventions. Public health campaigns are well suited for prevention efforts that target behavioral modification on a population level. As illustrated by Epstein et al., campaigns have the potential to affect not only large groups of people but also multiple cardiovascular outcomes, including stroke, coronary artery disease, heart failure, diabetes mellitus, dementia, and others.[10,11] As with every study, limitations remain. The study did not account for selection bias or the competing risk of death in the subanalyses of stroke and MI. The study did not have information on smoking cessation strategies or secondary stroke prevention strategies from

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the 179 sites. However, the notable strengths of this study include the appropriate interpretations of the study in the context of the limitations. This study highlights an important component of both clinical care of the stroke survivor and the public heath component of the need for better interventions for lifestyle modification.

The work presented by Epstein et al. in this issue of *Neurology* demonstrates the need for continued efforts toward risk reduction through behavioral modifications. The use of secondary stroke prevention medications has drastically reduced the risk of stroke; however, modification of lifestyle risk factors remains a necessary intervention avenue. The cumulative effects of these lifestyle risk factors influence stroke risk, and addressing one or more can have positive outcomes on the mortality and morbidity after a stroke. Epstein et al. highlight the need for both public health and individual interventions for smoking cessation for the prevention of stroke and other CVDs , as well as the difficulty in achieving smoking cessation, with 145 of the 450 (32%) smoking quitters resuming smoking.

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