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The effectiveness of smoking cessation interventions in smokers with cerebrovascular disease: a systematic review

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ABSTRACT

Objective: The main objective of this study was to determine the effectiveness of smoking cessation interventions (SCIs) for increasing cessation rates in smokers with cerebrovascular disease.

Design: Systematic review. Two independent reviewers searched information sources and assessed studies for inclusion/exclusion criteria.

Eligibility criteria for included studies: Randomised control trials, conducted prior to the 22 May 2012 investigating SCIs in smokers with cerebrovascular disease, were included. No age or ethnicity limitations were applied in order to be as inclusive as possible.

Methods: We followed the PRISMA statement approach to identify relevant randomised control studies. Due to the variability of interventions used in the reported studies, a meta-analysis was not conducted.

Results: Of 852 identified articles, 4 articles fit the inclusion criteria describing the outcome in 354 patients. The overall cessation rate with an SCI was 23.9% (42 of 176) while without one was 20.8% (37 of 178).

Conclusions: There are a limited number of reported intervention studies that explore this area of secondary stroke prevention. Furthermore, of those intervention studies that were found, only two implemented evidence-based approaches to smoking cessation. A meta-analysis was not conducted because of the variability of interventions in the reported studies. Larger studies with homogeneous interventions are needed to determine how effective SCIs are in increasing cessation in smokers with established cerebrovascular disease.

ARTICLE SUMMARY

Article focus

- To explore the effectiveness of smoking cessation interventions in smokers with cerebrovascular disease.

Key messages

- There are a limited number of intervention studies that explore this area of stroke prevention.
- Of those intervention studies found, only a few employed evidence-based approaches to smoking cessation.
- A meta-analysis was not conducted owing to the variability of reported intervention studies.

Strengths and limitations of this study

- This is the first review to explore the effectiveness of stop-smoking interventions in this high-risk group of smokers.
- This review explores the breadth of potential smoking cessation interventions in stroke and transient ischaemic attack patients.
- Limitations of this study include a small number of available of studies, large variability in population, intervention and outcome.

INTRODUCTION

Smoking prevalence has decreased in the USA over the last 40 years, and as of 2009, approximately 46 million people, or 20.6% of all adults (aged 18 years and older), in the USA smoked cigarettes.[1] It is estimated that over a quarter of all strokes can be attributed to smoking.[2] Large epidemiological cohort studies have demonstrated that cigarette smoking is a major independent risk factor for ischaemic stroke.[3–5]

The Framingham Heart Study demonstrated that heavy smokers (>40 cigarettes/day) were twice as likely to have a stroke compared to light smokers (between 1 and 10 cigarettes).[3] The risk of stroke decreased after 2 years of smoking cessation and was at the level of a non-smoker after 5 years of quitting.[3]

A meta-analysis of 32 studies found an increase of 50% relative risk (RR) of strokes (95% CI 1.4 to 1.6) was associated with cigarette smoking.[4] These studies provide support to the benefits of smoking cessation in patients with cerebrovascular disease. The risk of stroke declines soon after cessation among smokers

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regardless of age.[5]The data from observational studies have led to the general acceptance of the benefit of smoking cessation in stroke prevention. There is a lack of interventional studies and what is less established is the relative benefit of smoking cessation interventions (SCIs) in the stroke population.

The purpose of this systematic review is to present up-to-date information regarding the effectiveness of SCIs for increasing cessation rates in patients with established cerebrovascular disease.

METHODS

Data sources

Studies were identified from MEDLINE (1980 to present), EMBASE (1980 to present) and CENTRAL (22 May 2012) databases. The following MeSH terms were used to search the MEDLINE database: 'smoking cessation', 'stop or quit or cease or cessation', 'cerebrovascular disorders', 'brain ischemia', 'transient ischaemic attack', 'brain or cerebral', 'brain hemorrhage', 'brain or intracranial','cerebrum or cerebral', 'stroke', 'brain embolism and occlusive cerebrovascular disease'. Similar terms were used for EMBASE and CENTRAL databases.

Study selection

We followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) statement[6] for randomised control trials. We included studies if (1) patients were diagnosed with cerebrovascular disease by a physician or neurologist (2) we applied no ethnicity or age limitations in order to be as inclusive as possible; (3) we also included studies that reported SCI conditions (behavioural, pharmacotherapy, combination therapy). Finally, we excluded studies that did not report cessation rates.

Data extraction

We used a standardised form completed by two reviewers independently. We resolved discrepancies by consensus. Extracted data consisted of study characteristics (first author, year of publication), patient characteristics (mean age, number of smokers, type of stroke diagnosis), type of SCI (behavioural, pharmacotherapy, combination), length of follow-up of the intervention and cessation rates.

Outcome of interest

The main outcome of interest was the number of patients who quit smoking either using an SCI versus those who did not. Cessation rates were used from follow-up data from each study. Lost-to-follow-up patients were included in the denominators and were considered as smokers.

Quality of assessment of primary studies

We appraised selected articles for their methodological quality and bias using the Jadad scale.[7] The Jadad scale takes into account several methodological characteristics of clinical studies such as blinding, randomisation and dropouts.[7] Scores less than 3 were considered as low quality.

RESULTS

Effect of SCI on long-term quit rates

Of 852 articles identified, 4 articles were deemed to fit the inclusion criteria. Characteristics and flow of included studies can be found in table 1 and figure 1, respectively. An overall Jadad score of the selected papers was 3.75 of a possible score of 5. With an intervention, 42 of 176 smokers quit versus 37 of 178 in the control group. This resulted in an overall cessation rate of 23.9% for the intervention group compared to 20.8% for the control group.

Results of individual studies and risk of bias across studies

The first study explored the role of a patient and general practitioner systematic follow-up intervention to improve risk factor management after stroke.[8] The study recruited 523 consecutive incident stroke survivors of which 154 (29.4%) patients were identified as smokers at baseline. They were then randomised into the control (n=78) and intervention group (n=76). The overall intervention involved providing tailored evidence-based management advice to general practitioners, patients and caregivers poststroke. The advice consisted of treatment with antihypertensive therapy, treatment with antiplatelet therapy and smoking cessation. Smoking cessation advice was provided with regard to nicotine replacement therapy (NRT) use.[8] The authors found that at 1 year, 21 of 76 (27.6%) patients in the intervention group who received smoking cessation advice with regard to NRT quit smoking. In the control group at 1 year, 22 of 78 (28.2%) patients successfully quit smoking.[8]

The second study explored the impact of a stroke nurse specialist's input on risk factor modification.[9] The population was selected from a clinic of ambulant patients with a diagnosis of stroke or transient ischaemic attack (TIA) who were attending for on-going rehabilitation in a UK teaching hospital. There were 205 patients recruited, of which 78 patients were identified as smokers (38.0%). The intervention consisted of meetings at 3-month intervals with a stroke nurse specialist to discuss modification of lifestyle (diet, exercise or increased activity, smoking). The control group received usual care from medical staff.[9] Upon review of this paper, it was noted that cessation rates in the original paper were not reported. We consulted the principal investigator, and cessation rates are reported here from a 3-year follow-up study from McManus *et al*[10] from the original cohort. Reported cessation rates in the intervention group at 42 months was found to be 1 of 36 (2.8%).[10] None had quit in the control group (0 of 42; 0.0%).[10]

The third study was a pilot trial of standardised counselling and cost-free (CF) pharmacotherapy for smoking cessation in secondary stroke prevention.[11] Patients who

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Table 1 Characteristics of included studies

Study identification	Type of SCI/control	Patient characteristics	Jadad score	Cessation rate
Wolfe et al[8]	SCI: advice on NRT use	Intervention: 61 (22.3%) over 80 years, 126 (46.2%) female, 76 (27.9%) smokers	3	N intervention=21 of 76 (27.6%)
	Control: usual care	Control: 50 (20.2%) over 80 years, 118 (47.8%) female, 78 (32.2%) smokers		N control=22 of 78 (28.2%)
	Follow-up: 1 year			
Ellis *et al*[9]/ McManus *et al*[10]	SCI: discussion with nurse specialist on lifestyle modification in regards to smoking cessation	Intervention: 64.3 (95% CI 62.4 to 66.1, 95% CI) mean age, 54 (54.0%) male, 36 (36.0%) smokers	4	N intervention=1 of 36 (2.8%)
	Control: usual care	Control: 65.8 (95% CI 64.0 to 67.5) mean age, 52 (49.5%) male, 42 (40.0%) smokers		N control=0 of 42 (0.0%)
	Follow-up: 42 months			
Papadakis *et al*[11]	SCI: counselling and cost-free quit-smoking medications (NRT, bupropion, varenicline) with follow-up	Intervention: 55.4 (12.4 SD) mean age, 53.3% male, 15 (53.6%) smokers	4	N intervention=4 of 15 (26.6%)
	Control: usual care + prescriptions to pharmacotherapy	Control: 53.5 (8.1 SD), mean age, 69.2% male, 13 (46.4%) smokers.		N control=2 of 13 (15.4%)
	Follow-up: 26 weeks			
Frandsend *et al*[12]	SCI: counselling and cost-free NRT (gum, tablets, patches, nasal spray) with follow-up	Intervention: 29 (59.2%) age 50–65, 17 (34.7%) female, 49 smokers	4	N intervention=16 of 49 (32.7%)
	Control: 1 time 30 min counselling support	Control: 21 (46.7%) 50–65 age, 22 (48.9%) female, 45 smokers		N control=13 of 45 (28.9%)
	Follow-up: 6 months			

NRT, nicotine-replacement therapy; SCI, smoking cessation intervention.

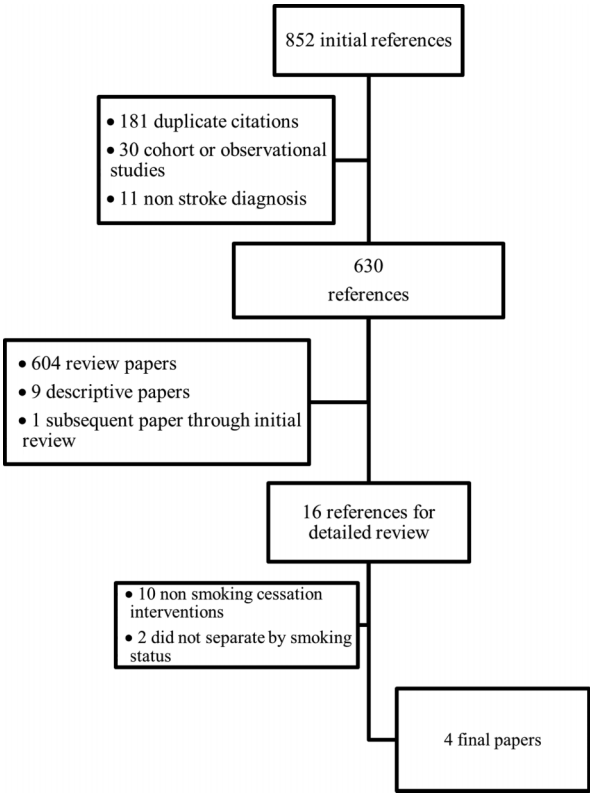

Figure 1 Exclusion criteria and paper selection procedure.

have recently experienced a TIA or stroke, or have been identified as being at high risk for a cerebrovascular event were recruited and were randomised to either CF intervention or prescription (P) control group. Patients randomised in the CF group received free-of-cost medications along with counselling with a smoking cessation nurse for 26 weeks.[11] A total of 255 smokers were identified and 28 participants were enrolled based on readiness to quit. The control group received usual care and prescriptions to pharmacotherapy. Cessation rates at 26 weeks for the intervention and control group was 4 of 15 (26.6%) and 2 of 13 (15.4%), respectively.[11]

The fourth study examined the difference between a minimal versus intensive SCI in increasing cessation rates in recruited patients with a recent stroke or TIA.[12] There were 94 smoking patients, with a recent stroke or TIA, that were recruited for this study.[12] For the purpose of this review, the intensive SCI was regarded as the intervention group, as this would be above and beyond what would be available in a 'real-world' setting. To simplify the comparison group and owing to the accessibility of smoking cessation counselling through a primary care physician or even a smoker's helpline, the minimal SCI group was considered the 'control' group. The control group consisted of a 30 min counselling session with the study nurse advising patients to quit smoking.[12]

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A total of 45 patients were randomised into the control group.[12] The intervention group received five sessions of smoking cessation counselling with the study nurse while receiving free NRT.[12] A total of 49 patients were randomised into the intervention group.[12] Cessation rates at 6 months for the intervention and control group was 16 of 49 (32.7%) and 13 of 45 (28.9%), respectively.[12]

There were some limitations to each study. Sample size was an issue in all of the included studies. For example, the small number of participants (n=28) in Papadakis *et al*'s[11] study meant that the study was relatively underpowered. Similarly, only 94 patients were recruited in the Frandsend *et al*'s[12] study. This study saw little effect of the intensive SCI. A larger trial would be needed to further explore the favourable trend documented in both studies. Furthermore, the provision of pharmacotherapy, counselling and follow-up may be an enhancement to 'real-world' standard of care experienced by TIA and stroke patients. A similar underpowered result due to a small sample size was observed in the study by Ellis *et al*[9]/McManus *et al*[10] They noted that the risk factor control in the control group was better than anticipated from pilot studies and in comparison to other trial evidence. Finally, all included studies recruited patients from fairly homogeneous sources such as two general practiceclinics,[8] hospitals[9 12] and a single stroke clinic,[11] which may not be generalisable to a broader stroke population in other settings.

DISCUSSION

The purpose of this systematic review was to determine the effectiveness of SCIs in increasing cessation rates in patients with established cerebrovascular disease.

Our results demonstrate that there were a limited number of reported interventional studies that explore this area of stroke prevention. Furthermore, there seems to be a lack of evidence-based implementation of proven SCIs. There is a link between suboptimal use of evidence-based smoking cessation medications and pharmacotherapy to poorer rates of smoking abstinence.[11] We found that only two of the four interventional studies[11 12] implemented evidence-based approaches to smoking cessation. The approach that these studies took fell in line with recommendations outlined in the *Clinical Practice Guideline: Treating Tobacco Use and Dependence: 2008 Update.*[13]

Fiore *et al*[13]suggested that effective smoking interventions consist of pharmacotherapy coupled with counselling and follow-up. First line pharmacotherapy such as NRT, buproprion and varenicline can double or even triple the likelihood of long-term smoking abstinence for heavy smokers (who consume >10 cigarettes/day) when coupled with behavioural counselling and follow-up.[14–16]

SCIs have been demonstrated to be effective in other populations in particular patients with coronary heart disease (CHD). CHD patients can benefit up to an increase of 44% in their cessation rate success.[17] A decrease of the risk of mortality and non-fatal myocardial infarction by 32% and 36%, respectively, has also been observed using this approach.[18] Larger clinical studies need to employ evidence-based approaches to smoking cessation to determine their effectiveness in smokers with cerebrovascular disease.

There are several limitations in the present study, which should be considered in any interpretation of the findings. There was a high degree of variability in regards to the population, intervention and outcome. For example, an array of stroke diagnoses was found ranging from incident stroke and TIA. A meta-analysis was not conducted due to the varied interventions from the reported studies. Wolfe *et al*[8] employed pharmacotherapy and advised patients on how to use them. Ellis *et al*[9]/McManus *et al*[10] used standard outpatient advice with postdischarge care from a nurse specialist. Papadakis *et al*[11] used CF pharmacotherapy with counselling support and follow-up. Finally, Frandsend *et al*[12] used intensive counselling support with CF pharmacotherapy. Given these differences in interventions and that each study was set in different countries (the UK, Canada and Denmark), would not have provided meaningful results from a meta-analysis. The duration of follow-up was also different among the included studies ranging from 3 to 42 months. Finally, cessation was only quantified biochemically by only two studies.[11 12] Wolfe *et al*[8] used both biochemical assays along with self-reported smoking status to quantify cessation. However, these authors only used the biochemical assays to determine the amount of misreporting in self-reported data and did not correct misreported smoking status.[8] Ellis *et al*[9] did not report how cessation was quantified.

CONCLUSION

The paper provided results from a systematic review that explored the effectiveness of SCIs for increasing cessation rates. We found a limited number of reported studies that explored this area of secondary stroke prevention. Furthermore, of those interventional studies that were found, only two studies implemented evidence-based approaches in smoking cessation. A meta-analysis was not conducted owing to the variability of interventions in the reported studies. Larger studies with homogeneous interventions are needed to determine how effective SCIs are in increasing cessation in smokers with established cerebrovascular disease.

Contributors RR conceived the primary research question for the study. RE was responsible for data extraction, the initial draft and subsequent revisions, production of the tables and figure(s) and interpretation of the results. RR and MS provided input into the interpretation of the results and provided critical revisions to the manuscript.

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