

Specific antismoking advice after stroke

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ABSTRACT

INTRODUCTION: Many stroke survivors would benefit from modification of their lifestyle in order to reduce their risk of recurrent stroke. We investigated if tailored smoking cessation advice would yield a higher smoking cessation rate and a higher rate with sustained abstinence in ex-smokers in the intervention group than among controls.

MATERIAL AND METHODS: Patients admitted with an acute stroke or a transient ischaemic attack were included in a randomised controlled trial focusing on control of lifestyle risk factors and hypertension. Here, we report the intervention focused on smoking cessation. We used multiple logistic regression analysis to identify patient characteristics associated with smoking cessation. Analyses were by intention to treat excluding those who died or suffered severe disease.

RESULTS: We included 254 patients with a history of smoking. Two years after inclusion, 15 of 57 (26%) baseline smokers in the intervention group had stopped smoking versus eight of 56 (14%) among controls ($p = 0.112$). Living with a partner ($p = 0.012$), having at least ten years of education ($p = 0.012$), and not being exposed to smoking at home ($p = 0.036$) were independent predictors of smoking cessation.

CONCLUSION: We did not achieve our aim of higher smoking cessation rates in the intervention group. Future smoking cessation interventions should be more intensive, focus on patients' social circumstances and, if possible, involve patients' relatives.

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TRIAL REGISTRATION: This protocol is registered with Clinical Trials.gov (NCT 00253097).

Over the past four decades, the incidence of stroke has decreased by 42% in high-income countries [1]. Positive trends regarding the incidence of recurrent stroke have been reported recently. Nevertheless, the risk of a stroke recurrence was 16.2% after five years in one study [2]. Lifestyle modification is recommended after stroke [3, 4] as poor dietary habits, physical inactivity and smoking will continue to increase cardiovascular risk despite pharmacological treatment of its consequences [5, 6].

There is a social gradient in the distribution of lifestyle factors with smoking and other types of risky health behaviour being more prevalent among people

with a lower socioeconomic status. Smoking cessation is an important target for the reduction of socioeconomic inequality in risk of stroke [7]. Lack of social support, social isolation and low literacy skills have been negatively associated with adherence to interventions aimed at risky health behavior [8]. Observational studies have shown that smoking cessation is not easily achieved in stroke patients with cessation rates as low as 11% after twelve months [9]. Randomised controlled trials (RCT) on lifestyle interventions in stroke survivors are few [10-13], and only one reported on smoking cessation [13].

The primary aim of the present study was to investigate if stroke survivors who were smokers and who were offered a home-based tailored smoking cessation intervention would achieve higher long-term smoking cessation rates than those who were offered usual treatment. The secondary aim was to investigate if more stroke survivors who were ex-smokers and who were offered a home-based tailored smoking cessation intervention would sustain long-term abstinence compared with those who were offered usual treatment.

MATERIAL AND METHODS

From November 2005 through September 2007, a total of 917 patients diagnosed with stroke or transient ischaemic attack (TIA) during their stay in the stroke unit of two Copenhagen University Hospitals were assessed for eligibility. Patients were eligible if they were discharged to their own home, were without cognitive deficits preventing their written consent and without morbidity that would make their two-year survival unlikely. Patients were invited to participate in a randomised controlled trial aimed at control of hypertension and lifestyle modification. Patients were included regardless of their baseline blood pressure. In this paper, we report the intervention aimed at smoking cessation.

As no studies of non-pharmacologic interventions on hypertension after stroke were available, we were unable to do a sample size calculation. Considering mortality and dropouts, we included 344 patients in order to have 100 participants for one-year follow-up in each group. An independent statistician produced a computer-generated block randomisation programme with concealed block size and allocation sequence with stratification according to baseline blood pressure < 140/90 mmHg/≥ 140/90 mmHg 1:1. Patients were randomised two days before discharge. None of the authors had ac-

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 TABLE 1

Baseline characteristics of 254 stroke patients with a history of smoking.

	Intervention group (n = 116)	Control group (n = 138)	p-value ^b
Age, yrs, median (IQR)	71 (58-79)	70 (60-79)	0.507
Female, gender, n (%)	44 (38)	58 (42)	0.805
Ischaemic stroke, n (%)	89 (76)	102 (74)	–
Haemorrhagic stroke, n (%)	3 (3)	7 (5)	–
TIA, n (%)	24 (21)	29 (21)	–
mRS score, n (%)	0.328		
0-2	92 (79)	117 (85)	
3-5	24 (21)	21 (15)	
Living with a partner, n (%)	54 (47)	68 (49)	0.926
Exposed to smoking at home, n (%)	19 (17)	27 (20)	0.497
Length of education, n (%)	0.804		
< 10 yrs	35 (30)	47 (34)	
10-12 yrs	30 (26)	34 (25)	
> 12 yrs	51 (44)	57 (41)	
Social isolation, n (%)	5 (4)	7 (5)	0.776
Weak social network, n (%)	12 (10)	12 (9)	0.654
Smoker, n (%)	0.324		
Current	61 (53)	64 (46)	
Ex	55 (47)	74 (54)	
Type of smoking ^a , n (%)	–		
Cigarettes	103 (89)	126 (91)	
Cheroots	10 (9)	14 (10)	
Cigars	6 (5)	6 (4)	
Pipe	23 (20)	30 (22)	
Pack yrs of tobacco, median (IQR)			
Current smoker	39 (27-50)	34 (25.5-50)	0.787
Ex-smoker	22 (10-41)	21 (9-40)	0.830
Abstinence from smoking, yrs, median (IQR)	25 (8-38)	19 (4-34)	0.229
Alcoholic drinks/week, median (IQR)	7 (1-21)	7 (1-20)	0.664
Sedentary lifestyle, n (%)	33 (28)	27 (20)	0.098
BMI ≥ 25 kg/m ² , n (%)	57 (50)	69 (51)	0.853

BMI = body mass index; IQR = interquartile range; mRS = Modified Rankin Scale; TIA = transient ischaemic attack.

a) Many smoked > 1 type of tobacco; b) By χ^2 - or Mann-Whitney-test.

cess to the randomisation programme. The study design was approved by the regional ethics committee (KF 01 260 869). The protocol is registered with Clinical Trials.gov (NCT 00253097).

Baseline data

Study nurses interviewed patients for the collection of baseline data during their stay in hospital. The severity of the stroke symptoms was assessed using the modified Rankin Scale (mRS) score running from zero indicating “No symptoms” to six “Dead”. They collected data on marital status^a: married, living with a partner, widowed, divorced, and single. Patients in the first two categories were categorised as living with a partner. Patients’ combined school education and vocational training were classified in accordance with International Standard Classification of Education.

We calculated number of pack years with 20 g of tobacco daily for one year giving one pack year. Usual level of alcohol consumed per week was reported. Patients indicated the statement that best described their level of physical activity^{*}: 1) Almost completely inactive; 2) Some physical activity for at least four hours/week; 3) Regular activity; 4) Regular hard, physical training for competition. We categorised patients in the first category as sedentary. Body mass index (BMI) was calculated as kg/m². We collected data on patients’ reasons for giving up smoking. See **Table 1**.

**) In accordance with questions and answers used for the Public Health Reports by the Danish National Institute of Public Health.*

The intervention

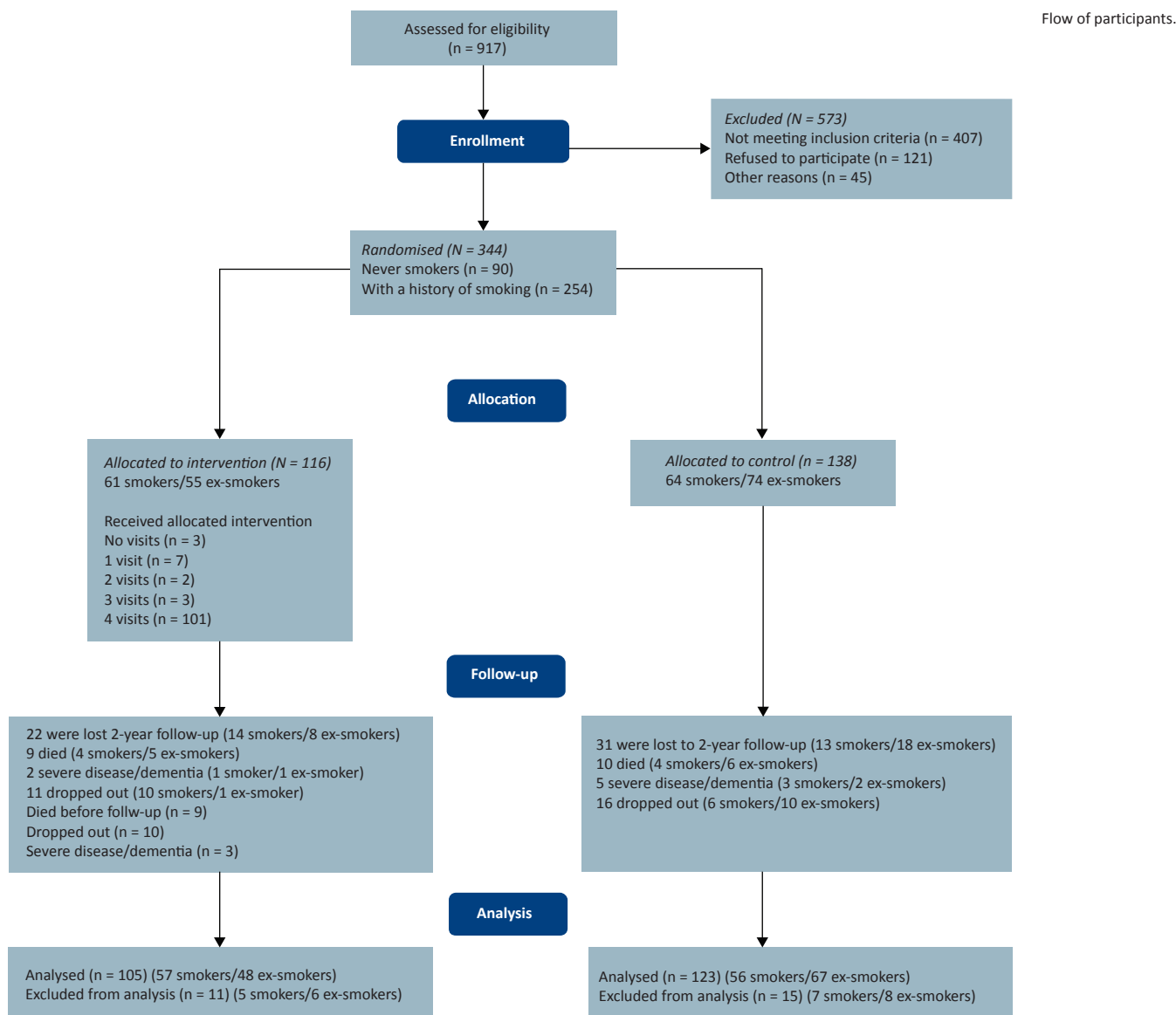
Study nurses trained to perform a motivational interview [14] provided home-based intervention visits to those allocated to the intervention one, four, seven and ten months after discharge from hospital. Visits usually lasted for an hour with tailored advice on smoking cessation or continued refraining from smoking. During the first visit, the nurses explained the association between smoking and risk of stroke. Written smoking cessation guides from the National Health Institute and information about the national free of charge telephone-based smoking cessation support was given to current smokers. Based on the principles of motivational interviewing, they used an empathic non-moralising approach. Smokers were informed about nicotine replacement therapy (NRT) with more detailed information given to those in the more advanced stages of the changing process [15]. The nurses warned those who stopped smoking about particularly risky situations such as after a good dinner, at parties and when being exposed to smoking.

The control group had the usual treatment of the stroke units: lifestyle counselling including one session with a nurse trained to do a motivational interview. Two-year follow-up in patients’ own home was performed from January 2008 through September 2009 by study nurses not involved in the intervention of the patients and blinded to their group allocation.

Statistical analysis

We used intention to treat analysis excluding those without follow-up due to death or serious disease. For those who dropped out, we used baseline data on smoking. The probability of dying/severe disease and dropping out was analysed using multiple logistic regression with all baseline variables as explanatory variables giving odds ratios (OR) and their 95% confidence intervals (CI). For comparison of proportions between those allocated to intervention and controls, we used the χ^2 -test or Fish-

FIGURE 1



er's exact test, as appropriate. We calculated medians and interquartile ranges (IQR) for continuous data and used the Wilcoxon-Mann Whitney test for comparison between groups. For the identification of variables associated with smoking cessation at two-year follow-up, we performed a multiple logistic regression analysis with backwards elimination of the following variables: age, sex, mRS score, marital status, living with a smoker, length of education, pack years of tobacco, physical activity and group allocation. Due to problems with the maximum likelihood estimate, we could not perform this analysis for the outcome of abstinence from smoking in ex-smokers. We conducted a per protocol analysis in-

cluding those who remained for two-year follow-up. A probability value of < 0.05 was considered statistically significant. NH and KL carried out data analyses using SAS 9.2 for Windows.

Trial registration: The protocol is registered with Clinical Trialsgov (NCT 00253097).

RESULTS

We included 254 patients with a history of smoking: 125 current smokers and 129 ex-smokers (**Figure 1**).

In the intervention group, 15 of 57 (26%) of baseline current smokers versus eight of 56 (14%) of controls

had stopped smoking ($p = 0.112$). Among baseline ex-smokers, three of 48 (6%) in the intervention group and six of 67 (9%) of controls had relapsed to smoking ($p = 0.594$).

Multiple logistic regression showed that living with a partner: OR = 3.6 (95% CI: 1.2-10.2) ($p = 0.012$), having at least ten years of education: OR = 6.4 (95% CI: 1.4-30.3) ($p = 0.012$) and not being exposed to smoking at home: OR = 7.3 (95% CI: 1.4-37.5) ($p = 0.036$) were independent predictors of smoking cessation two years after stroke.

The per protocol analysis of 201 participants showed that 15 of 47 (32%) of baseline current smokers versus seven of 50 (14%) of controls had stopped smoking ($p = 0.035$) at two-year follow-up. Among baseline ex-smokers, three of 47 (6%) in the intervention group and six of 57 (11%) of controls had relapsed to smoking ($p = 0.455$).

Being physically active reduced the risk of death/severe disease: OR = 0.33 (95% CI: 0.13-0.79) ($p = 0.013$) and older age was an independent predictor of death/severe disease: OR = 1.08 (95% CI: 1.04-1.12) ($p = 0.0003$). Having less than ten years of education was associated to dropping out of the study: OR = 3.0 (95% CI: 1.0-9.0) ($p = 0.049$).

The majority of those with successful smoking cessation stopped smoking during the first year after their stroke. They were mainly motivated by a wish to promote their health, but also taking advice from health-care staff and near ones were mentioned. The study nurses estimated the patients' motivation for smoking cessation in 44 current smokers in the intervention group. On a scale from 1-10 with one indicating no motivation and ten indicating the highest degree of motivation, the median score was three. By two-year follow-up, the median daily amount of tobacco smoked was 18 g (IQR 10-20) in the intervention group and 15 g (IQR 8-20) in the control group ($p = 0.844$).

NRT was not widely used as most smokers found it too expensive.

DISCUSSION

Two years after stroke, we found no differences regarding smoking cessation between the intervention group and controls. The patients' social circumstances were the only independent predictors of smoking cessation, which indicates that the intervention lacked the power to achieve the intended aim. Also the proportions of ex-smokers who relapsed to smoking were similar in the two groups, which stresses the need for continued support to ex-smokers after stroke with the active involvement of the patients' smoking partners.

In line with our study, the "Stop Stroke" cluster trial aimed at more than one risk factor for recurrent stroke

[13]. General practitioners' (GP) practices were randomised to intervention, i.e. receipt of tailored evidence-based secondary prevention plans for patients in their practice who had suffered a stroke within the previous six months, or control with no intervention. Baseline data on the patients' risk factors were collected by face-to-face interview at the hospital or in patients' own home. Home-based visits for the collection of data on the patients' risk factor management were performed after three and six months followed by posted written information on secondary prevention sent to patients, caregivers and GPs up to three times. The intervention addressed antihypertensive treatment, treatment with antiplatelets and smoking cessation. As in our study, no difference between participants in the two groups was found at follow-up after 18 months.

In an RCT including 209 current smokers hospitalised with acute cardiovascular disease, 33% of patients in the intervention group achieved continued smoking cessation at two-year follow-up compared with only 9% in the usual care group ($p < 0.0001$). Weekly counselling sessions initiated one week after discharge and continued for a minimum of 12 weeks with the provision of NRT at no cost, which was used by 75% of participants may explain the success of this study. The four intervention sessions in our study were provided with much longer intervals. Infrequent contact with smokers may be one reason why we did not achieve the aim of our study. NRT has been shown to improve smoking cessation rates [16]. Most participants in our study found that NRT was too expensive, and it was not widely used. In a nurse-led randomised controlled trial including 288 patients admitted with an acute myocardial infarction (MI), telephone follow-up was used to support patients' own coping strategies regarding smoking cessation and other lifestyle modification efforts. Weekly calls and an open telephone line were initiated one week after discharge [17]. Of those with six-month follow-up, 60% of patients in the intervention group versus 40.8% in the control group had quit smoking ($p = 0.055$). The intensity of this trial and differences in the target populations may explain the much higher cessation rates compared with our study.

Stroke patients and patients diagnosed with MI share symptoms like post-event depression and fatigue. However, cognitive impairments like lack of motivation and initiative may present a further challenge to stroke patients trying to change a risky lifestyle.

Limitations

This is a small study and advice from study nurses was not supported by NRT. Smoking was self-reported. Self-reported quitting rates have been shown to be higher than those provided by biochemical confirmation [13].

CONCLUSION

We did not achieve a higher rate of smoking cessation and there was no difference regarding relapse to smoking in ex-smokers in the intervention group compared with controls two years after stroke. Living with a partner and not being exposed to smoking at home were associated with smoking cessation. Also having at least ten years of education was an independent predictor of smoking cessation. The majority of baseline smokers were still smoking two years after stroke. There is a need for more intensive and larger intervention studies in this field focusing on patients' social circumstances and, if possible, with the involvement of patients' relatives, preferably addressing smoking cessation only. Weekly sessions of support and free of charge NRT should be offered to those with a motivation to stop smoking. Even if the effect of smoking cessation on stroke recurrence has not yet been demonstrated, any step to slow down the atherosclerotic process should be taken in these high-risk patients.

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