

# A prospective study of primary and secondary risk factor management in stroke patients

**ABSTRACT**—Stroke is a common event which often results in death or major loss of independence with immense human and financial costs, so identification of patients at risk, and prevention of stroke at the individual and population levels, is a high clinical and health priority. From August 1993 to July 1994, 468 stroke patients admitted to our hospital were assessed for the presence of stroke risk factors. All patients were followed up in hospital, and on discharge or death all hospital records were reviewed. We show that many risk factors remain uncorrected in stroke patients and that preventive measures are less than ideal at the community and hospital levels alike.

A possible explanation for the decrease in stroke mortality rates in recent years in Western Europe, North America, Australia and New Zealand is a change in the level of risk factors [1,2]. Despite this, stroke remains a significant cause of death in the developed and developing world. Primary and secondary prevention of stroke by risk factor modification could bring about a further decrease in the number of strokes in the community and in their associated disability and handicap [3]. Potentially modifiable risk factors include hypertension, atrial fibrillation, transient ischaemic attack, previous stroke, ischaemic heart disease, cigarette smoking, diabetes mellitus and heavy alcohol intake. The aim of the present study was to estimate prospectively the prevalence of potentially modifiable risk factors in an unselected cohort of stroke patients and to document how these risk factors were managed before admission, in hospital and on the patients' discharge back to the community.

## Patients and methods

The study was carried out at one of three acute hospitals in Leicestershire which together serve a total population of 860,000. Between 1 August 1993 and 31 July 1994, 468 stroke patients admitted to Leicester General Hospital were identified prospectively by a doctor within 24 hours of admission, according to the World Health Organisation standard definition: rapidly developing clinical signs of focal and at times global loss of cerebral function with symptoms lasting

more than 24 hours or leading to death and with no apparent cause other than that of vascular origin [4].

## Assessment

A history was obtained from the patient or through interview with the closest friend or relative. On physical examination particular attention was paid to the presence of the following risk factors: previous stroke, hypertension, ischaemic heart disease, atrial fibrillation (AF), diabetes mellitus, smoking (never, former or current) and medication, especially anti-hypertensives or antithrombotic drugs (aspirin and/or warfarin). These items were compared with the hospital notes and general practitioner's referral letter. On discharge or death the doctor reviewed all available hospital records.

## Results

The mean age of the 468 patients was 75 years (range 39–102); 247 (53%) were men, 139 (29.7%) had a head CT scan which confirmed a cerebral infarction in 104, and 347 (74%) were discharged from hospital. Table 1 and Fig 1 show the percentage and age distribution of risk factors on admission. Only 19% of those with first-ever stroke were free of any known risk factors on admission. Similar rates of risk factors were found among patients admitted with their second stroke (Table 2). On admission 136 (29%) of all the stroke patients were on aspirin, compared with 138 (39%) of the 347 stroke patients discharged from hospital (Fig 2). Of the 63 cases of cerebral infarction confirmed by CT scan, 33 (52%) were discharged on

**Table 1. Prevalence of risk factors among 468 stroke patients on admission**

| Risk factor                      | Number of patients |
|----------------------------------|--------------------|
| None of the following recognised | 90 (19.2%)         |
| Hypertension                     | 171 (36.5%)        |
| Previous stroke                  | 169 (36.1%)        |
| Ischaemic heart disease          | 116 (24.8%)        |
| Atrial fibrillation              | 81 (17.3%)         |
| Smoking (current)                | 80 (17.1%)         |
| Smoking (former)                 | 125 (26.5%)        |
| Diabetes mellitus                | 63 (13.5%)         |
| Alcohol $\geq 16$ units/week     | 18 (3.8%)          |

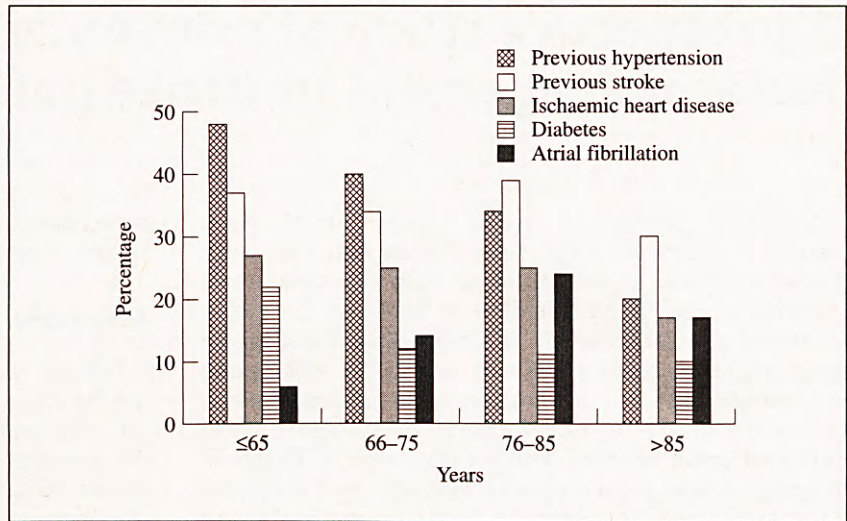
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Fig 1. Age distribution for risk factors in stroke patients



aspirin, and 77 (45%) of those admitted with their second stroke were on aspirin. Of 78 patients admitted with a past history and electrocardiographic evidence of atrial fibrillation (AF), 64 were on digoxin but only 26 (33%) were on aspirin and 7 (9%) on warfarin; 13 (22%) of 58 patients with AF were discharged home on aspirin and 7 (12%) on warfarin. Of 166 stroke patients with past history of hypertension on admission, 123 (74%) were on antihypertensive therapy and the prevalence of previously diagnosed hypertension decreased with age (Fig 1). Of the 43 patients not on antihypertensive treatment, 35 had a systolic pressure > 160 mm Hg and/or a diastolic pressure > 90 mm Hg following admission. The prevalence of risk factors alters with age; diabetes, previous hypertension and ischaemic heart disease are more common in young stroke patients and AF is less common (Fig 1).

**Discussion**

There is a high level of risk factors in those with first-ever (81%) and second stroke (82%), and a trend for clustering of risk factors among stroke patients. We have found in this study that preventive activities to reduce the incidence of stroke are less than ideal.

Although CT scan is recommended for all stroke and TIA patients to confirm the diagnosis of cerebral infarction or haemorrhage and to exclude other diagnoses [5], only 29.7% of the stroke patients were scanned, possibly owing to lack of resources or because doctors were not convinced of the benefits of scanning, but this may have caused a considerable number of the stroke patients to leave hospital without receiving appropriate preventive treatment. Age and degree of dependency also may have contributed to the underuse of prophylactic therapy.

There is no doubt about the value of antiplatelet treatment in the prevention of occlusive cerebrovascular disease [6], though not for primary preven-

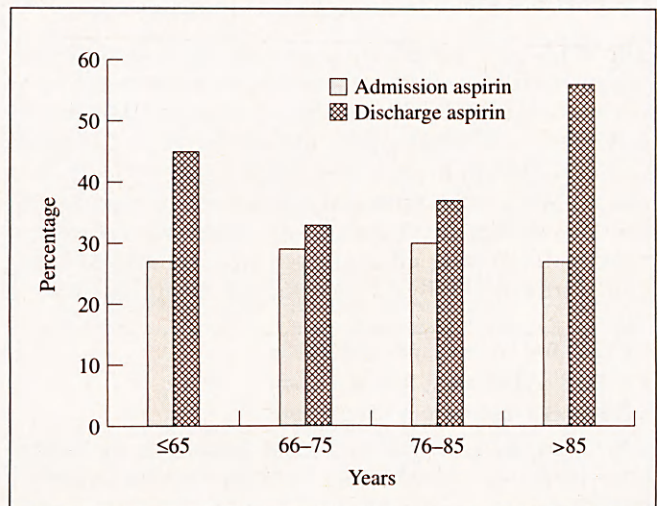
tion [7]. Nevertheless, 61% of stroke patients left hospital without aspirin, and 54.5% of those admitted with their second stroke were not taking this drug.

In five randomised trials, warfarin decreased the risk of stroke by 68% in patients with atrial fibrillation, with virtually no increase in the frequency of bleeding

Table 2. Risk factors in first-ever and second stroke patients on admission

|                   | No factor  | One factor  | Two or more factors |
|-------------------|------------|-------------|---------------------|
| First-ever stroke | 90 (19.2%) | 150 (32.1%) | 228 (48.7%)         |
| Second stroke     | 30 (17.8%) | 55 (32.5%)  | 84 (49.7%)          |

Fig 2. Age distribution for aspirin intake in stroke patients



[8]. Although some patients with electrocardiographic evidence of AF on admission would previously not have been known to fibrillate, 82% were on digoxin on admission and 66% of patients with established AF were discharged home without antiplatelet or anticoagulant drugs.

There is substantial epidemiological evidence that treatment of hypertension reduces the risk of stroke [9–13]; up to 70% may be preventable by such treatment [3]. Even though hypertension was the best treated risk factor in the community, in this study 43 of the stroke patients with a past history of hypertension had not been on antihypertensive medication. The prevalence of treated hypertension decreased with age, possibly reflecting underdiagnosis in the elder group.

In conclusion, many strokes are preventable; most physicians and the public take stroke seriously and are interested in opportunities for prevention. The barriers to undertaking preventive action need to be addressed, especially in hospital where the pace is perhaps set for the community. There is also room for further public education on smoking and alcohol consumption.

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