Evaluation of investigations to diagnose the cause of dizziness in elderly people: a community based controlled study

Nicki R Colledge, Robin M Barr-Hamilton, Susan J Lewis, Robin J Sellar, Janet A Wilson

Abstract

***Objective*—To compare the findings in dizzy elderly people with those in controls of a similar age to identify which investigations differentiate dizzy from non-dizzy patients and to design an investigational algorithm.**

***Design*—Community based study of clinical and laboratory findings in dizzy and control elderly people.**

***Setting*—Research outpatient clinic at a teaching hospital.**

***Subjects*—149 dizzy and 97 control subjects aged over 65 years recruited from a community survey and articles in the local press.**

***Main outcome measures*—Findings on physical examination, blood testing, electrocardiography (at rest and over 24 hours), electronystagmography, posturography, and magnetic resonance imaging of head and neck (125 (84%) dizzy subjects and 86 (89%) controls); hospital anxiety and depression score; responses to hyperventilation, carotid sinus massage, and the Hallpike manoeuvre.**

***Results*—Blood profile, electrocardiography, electronystagmography, and magnetic resonance imaging failed to distinguish dizzy from control subjects because of the frequency of asymptomatic abnormalities in controls. Posturography and clinical assessment (physical examination, dizziness provocation, and psychological assessment) showed significant differences between the groups. A cause of the dizziness was identified from clinical diagnostic criteria based on accepted definitions in 143 subjects, with 126 having more than one cause. The most common diagnoses were central vascular disease (105) and cervical spondylosis (98), often accompanied by poor vision and anxiety.**

***Conclusion*—Expensive investigations are rarely helpful in dizzy elderly people. The cause of the dizziness can be diagnosed in most cases on the basis of a thorough clinical examination without recourse to hospital referral.**

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BMJ 1996;313:788–92

Introduction

Dizziness is reported by about 30% of people aged over 65 years,[1-5] and in the United States it is the most common presenting complaint in office practice among patients aged over 75 years.[3] Dizziness is a difficult diagnostic problem in elderly people as it has many potential causes and patients often find it difficult to articulate the nature of their symptoms.

Most previous studies on dizziness in older people have been retrospective, uncontrolled, and based in secondary or tertiary referral settings.[6-12] The most common diagnosis reported in referred patients is peripheral vestibular disease,[7 9-12] but the patients included are unlikely to be representative of those who attend their general practitioner with dizziness.

We compared the findings in dizzy elderly people recruited from the community with those in elderly control subjects to identify the investigations that distinguish dizzy from non-dizzy people and to construct an investigational algorithm.

Methods

SUBJECTS

Subjects over 65 years old were invited to take part through articles in the local press and through our local survey of dizziness in 1000 people over 65.[5] Those who called a contact telephone number were sent information about the study. We obtained signed consent and the permission of each person's general practitioner before formal recruitment. Only those who suffered from dizziness every three months or more were recruited to the dizzy group, and only those who had never been dizzy were recruited to the control group. No other inclusion or exclusion criteria were applied. The study had full approval of an ethics committee. We intended to study 100 dizzy and 100 control subjects, but all 149 suitable dizzy volunteers were recruited to avoid selection bias.

EVALUATION

We recorded dizzy symptoms, medical history, current treatments, and functional ability. One of us (NRC) performed all the clinical assessments.

Visual acuity and assessment of the cardiovascular, neurological, and locomotor systems were included in a physical examination. All subjects were assessed for dizziness during 2 minutes of hyperventilation, during rapid head or neck movement, after standing up from supine (blood pressure was measured at once and after one minute), and during Romberg's test. Carotid sinus massage was performed under continuous electrocardiographic monitoring, except in subjects with a carotid bruit or those who were taking digoxin. The Hallpike manoeuvre was performed for benign paroxysmal positional vertigo. Each subject was tipped from sitting to supine with their neck extended over the end of a couch, first with their head rotated to the right and then repeated with the head to the left. Subjects with benign paroxysmal positional vertigo have a latent period of a few seconds before they develop acute vertigo and torsional nystagmus, which last up to 1 minute and fatigue on repeat testing.[13] Patients were also administered the hospital anxiety and depression scale, a questionnaire of 20 items validated for use in outpatient settings,[14] and the abbreviated mental test.[15]

A blood sample was taken for measurement of blood count, erythrocyte sedimentation rate, urea and electrolyte concentrations, random glucose concentration, triglyceride concentration, and cholesterol concentration and for performance of liver and thyroid function tests. Patients also had 12 lead and 24 hour ambulatory electrocardiography.

Posturography was performed using our static computerised force platform.[16] The contribution of

Table 1—*Characteristics of dizzy and control subjects. Values are numbers (percentages) of subjects*

	Dizzy group (n = 149)	Control group (n = 97)	P value
Ischaemic heart disease	34 (23)	11 (11)	0.04
Stroke	11 (7)	1 (1)	0.03
Ear disease	31 (21)	10 (10)	0.047
Eye disease	52 (35)	12 (12)	<0.001
Diabetes mellitus	7 (5)	3 (3)	0.74
Hypertension	26 (17)	15 (15)	0.82
Joint disease	82 (55)	51 (53)	0.80
Head injury	11 (7)	2 (2)	0.13
Smoking	30 (20)	6 (6)	0.003
Regular alcohol intake	66 (44)	53 (55)	0.15
Drug treatment:			
Diuretic	40 (27)	13 (13)	0.019
Calcium antagonist	17 (11)	1 (1)	0.005
Aspirin	42 (28)	10 (10)	0.001
Walking aid used	37 (25)	7 (7)	<0.001

Table 2—*Findings on physical examination in dizzy and control subjects. Values are numbers (percentages) of subjects*

	Dizzy group (n = 149)	Control group (n = 97)	P value
Motor system			
Reduced power in legs	26 (17)	2 (2)	0.0005
Increased tone in legs	38 (26)	7 (7)	0.0006
Abnormal results in heel-knee test	46 (31)	2 (2)	<0.00001
Past pointing	16 (11)	1 (1)	0.007
Dysdiadochokinesis	35 (24)	5 (5)	0.0003
Increased reflexes in legs	59 (40)	24 (25)	0.01
Extensor plantar responses	24 (16)	4 (4)	0.004
Abnormal gait	54 (36)	10 (10)	<0.0001
Locomotor system			
Limited neck movement	77 (52)	35 (36)	0.023
Limited hip movement	25 (17)	11 (11)	0.026
Cardiovascular system			
Carotid bruit	18 (12)	3 (3)	0.026
Visual acuity			
Less than 6/9 in both eyes	22 (15)	4 (4)	0.015

Table 3—*Numbers (percentages) of dizzy and control subjects with positive responses to provocation of dizziness*

	Dizzy group (n = 149)	Control group (n = 97)	P value
Hyperventilation	30 (20)	6 (6)	0.004
Head turning	57 (38)	6 (6)	<0.001
Hallpike manoeuvre	13 (9)	3 (3)	0.13
Romberg's test	32 (22)	1 (1)	<0.0001
Carotid sinus massage	0	0	
Postural change:			
Fall in blood pressure:			
With symptoms	14 (9)	1 (1)	0.001
Without symptoms	23 (15)	13 (13)	0.068
No fall in blood pressure:			
With symptoms	46 (31)	3 (3)	<0.0001
Without symptoms	66 (44)	80 (83)	<0.001

Table 4—*Results of psychological testing in dizzy and control subjects. Values are numbers (percentages) of subjects*

	Dizzy group (n = 149)	Control group (n = 97)	P value
Anxiety:			
Normal (score <8)	95 (64)	83 (86)	
Borderline (score 8-10)	31 (21)	9 (9)	0.009
Abnormal (score ≥11)	23 (15)	5 (5)	0.008
Depression:			
Normal (score <8)	126 (85)	92 (95)	
Borderline (score 8-10)	16 (11)	5 (5)	0.16
Abnormal (score ≥11)	7 (5)	0	0.04
Abbreviated mental test:			
Score <10	57 (38)	13 (13)	<0.0001

each sensory system was assessed by recording the sway path length of a subject's centre of gravity while standing for 1 minute on a firm surface with eyes open (test 1), on a firm surface with eyes closed to remove visual input (test 2), on a foam surface with eyes open to remove reliable proprioceptive input (test 3), and on a foam surface with eyes closed, which effectively leaves only vestibular input (test 4).

Vestibular testing was performed using computed electronystagmography with a Nicolet Nystar system (Nicolet Instruments, Warwick). Saccadic eye movements, pursuit of an object, optokinetic nystagmus, and any spontaneous and positional nystagmus were recorded; bithermal caloric testing was also performed.

Magnetic resonance images of head and neck were obtained with a Siemens 1.5 Tesla scanner; images were reported according to a standardised format by a consultant neuroradiologist (RJS) who was blind to whether the subject had dizziness. Subjects with cardiac pacemakers or intracranial ferromagnetic clips did not undergo scanning.

STATISTICAL ANALYSIS

Analysis was performed using the statistical package for the social sciences (SPSS). The Mann-Whitney U test, Student's t test, and χ^2 tests were used with Yates's correction for continuity and Fisher's exact test as appropriate. The distribution of the data from posturography was skewed, so the data were transformed logarithmically before analysis. Subjects were categorised as having normal or abnormal sway using reference intervals previously derived from normal volunteers aged 60-70 and over 70.[16]

Results

SUBJECT CHARACTERISTICS

We recruited 149 subjects with dizziness and 97 controls. The mean age of the dizzy subjects was 76.3 (SD 6.2) years, and 69 (49%) were men; the mean age of the controls was 76.0 (5.8) years, and 39 (40%) were men. Significantly more dizzy subjects were smokers and had a history of myocardial infarction or angina, stroke, ear disease, and eye disease (table 1). Dizzy subjects took a median of three drugs while controls took one ($P<0.0001$).

Most dizzy subjects (116) defined their symptoms as unsteadiness, 37 as vertigo, and 89 as light-headedness, with 83 describing more than one sensation. Most symptoms were longstanding (more than six months in 140 patients) and episodic (in 130 patients). Symptoms were provoked by standing up in 94 patients, bending in 86, head or neck movement in 86, turning in bed in 20, and anxiety in 43; dizziness occurred spontaneously in 70 patients. Forty three dizzy subjects had fallen, but other associated symptoms were uncommon. Syncope occurred in nine subjects.

Physical examination of the dizzy and control subjects showed significant differences in the neuromotor and locomotor systems (table 2) but not in sensory or cranial nerve function or in the frequency of femoral bruits or cardiac murmurs. Most provocation tests produced significantly more positive responses in the dizzy group (table 3). On changing posture significantly more dizzy subjects had symptoms than a drop in blood pressure.

Psychological testing showed significant differences between the two groups (table 4). Although more dizzy subjects scored less than 10 in the abbreviated mental test, no subject scored less than 7.

RESULTS OF INVESTIGATIONS

No significant differences were found between the two groups in the results of blood tests or in the frequency of electrocardiographic abnormalities.

Table 5—*Results of posturography in dizzy and control subjects. Values are numbers (percentages) of subjects*

Test	Dizzy group (n = 149)	Control group (n = 97)	P value
1: Standing on firm base, eyes open	23 (15)	4 (4)	0.010
2: Standing on firm base, eyes closed	19 (13)	2 (2)	0.007
3: Standing on foam base, eyes open	50 (34)	9 (9)	<0.0001
4: Standing on foam base, eyes closed	50 (34)	10 (10)	<0.0001

Table 6—*Diagnosis of cause of dizziness in 149 dizzy subjects*

Diagnosis	No of subjects
Central vascular disease	105
Cervical spondylosis	98
Anxiety or hyperventilation	48
Poor vision	23
Postural hypotension	14
Benign positional vertigo	6
Other	38
No diagnosis	6
More than one diagnosis	126
Neck disease and central vascular disease:	
Both	68
Neither	14
Poor vision only	0
Anxiety or hyperventilation only	3

Twenty four hour ambulatory electrocardiography gave normal results in 104 (70%) dizzy subjects, of whom half had symptoms during the recording, and in 71 (73%) control subjects. The most common abnormality in the remainder of both groups was brief episodes of paroxysmal atrial fibrillation. No subject in either group had associated symptoms.

Most subjects in both groups (119 (80%) *v* 77 (79%)) had two or more electronystagmographic abnormalities. There was no difference in rate or type of abnormality between the two groups, as assessed by the age matched normative ranges supplied by the manufacturers. In contrast, posturography showed significant differences in rates of abnormality in all tests (table 5).

Overall, 125 (84%) dizzy subjects and 86 (89%) control subjects underwent magnetic resonance imaging. In the remainder, scanning was contraindicated, refused, or not tolerated. Abnormalities were widespread and present in most subjects regardless of group. Eighty seven (70%) dizzy subjects and 57 (66%) control subjects had facet joint degeneration, 105 (84%) dizzy subjects and 70 (81%) controls had cerebral atrophy, and 85 (68%) and 64 (74%) respectively had white matter lesions in the cerebral hemispheres.

DIAGNOSTIC LABELLING

We used clinically based criteria derived from accepted definitions to diagnose the cause of dizziness (box 1) in the affected subjects (table 6). There were no significant differences in the prevalence of posturographic abnormalities in the different diagnostic groups.

Discussion

To our knowledge, this is the first study to apply a wide range of investigations for dizziness in a community based sample of elderly subjects. Some selection bias is inevitable: very frail elderly people may have felt unable to take part; those more concerned about their symptoms may have been more likely to volunteer (which might explain the frequency of anxiety found in the dizzy group); and those with more sinister causes may have been identified earlier by their general practitioners. None the less, our sample of dizzy subjects is likely to represent those people who are most difficult to manage in general practice. The control group may have been fitter than average for their age, but they were no different from the dizzy subjects in terms of age and functional ability.

USE OF FORMAL INVESTIGATIONS

Routine use of electrocardiography, electronystagmography, blood testing, and magnetic resonance imaging is unhelpful because of the frequency of abnormalities in symptom free subjects. The high prevalence of asymptomatic abnormalities in healthy volunteers on electronystagmography is remarkable and doubtless partly explains why previous uncontrolled studies have claimed such a high rate of vestibular disease in this age group.[7 9-12] Our study has confirmed the frequency with which magnetic resonance imaging abnormalities occur in symptom free elderly subjects.[20 21]

Posturography gave abnormal results more often in dizzy subjects than controls, but it lacked diagnostic specificity, perhaps because most subjects had several diagnoses. Its value may therefore be more as a measure of severity of disability or response to treatment.

DIAGNOSES

Most subjects had several causes of dizziness that could be elicited from clinical assessment without further formal investigation. All subjects were examined by the same person so assessments are likely to have been consistent, but the fact that she could not be blinded to whether subjects had dizziness is a weakness of the study.

The presence of an abnormal gait (marche à petits pas) with varying combinations of increased reflexes and tone in the legs, abnormal coordination and extensor plantar responses, and comparative sparing of the upper half of the body is in keeping with a diagnosis of cerebrovascular disease or "pseudoparkinsonism."[22] Its association with postural instability and falls is well recognised. The lack of any clinically significant sensory loss or cranial nerve abnormality was surprising, as previous reports have suggested that these are significant causes of imbalance in old age.[23]

Cerebrovascular and neck disease were far more common than peripheral vestibular disease in our community derived sample. The finding that dizzy subjects more commonly had a history of ischaemic heart disease, stroke, and smoking and had a carotid bruit on examination suggests that vascular disease may be the most important pathophysiology underlying dizziness in elderly people. It may also explain why more dizzy subjects took aspirin, diuretics, and calcium antagonists, although the drugs themselves could also contribute to the dizziness.

Visual impairment and anxiety commonly accompanied dizziness, but they were rarely the only causes. By contrast, anxiety is often the cause of dizziness in younger people.[7 24] None the less, efforts to improve vision and reduce anxiety might help alleviate symptoms in elderly people.

Others have noted a high prevalence of the carotid sinus syndrome among elderly people who have unexplained dizziness, falls, and syncope, particularly when carotid sinus massage is performed with the patient upright.[17] We found no such evidence, but our subjects were less highly selected and did not have tilt testing, so some of our subjects might also have had this condition, although most had at least two other causes of dizziness.

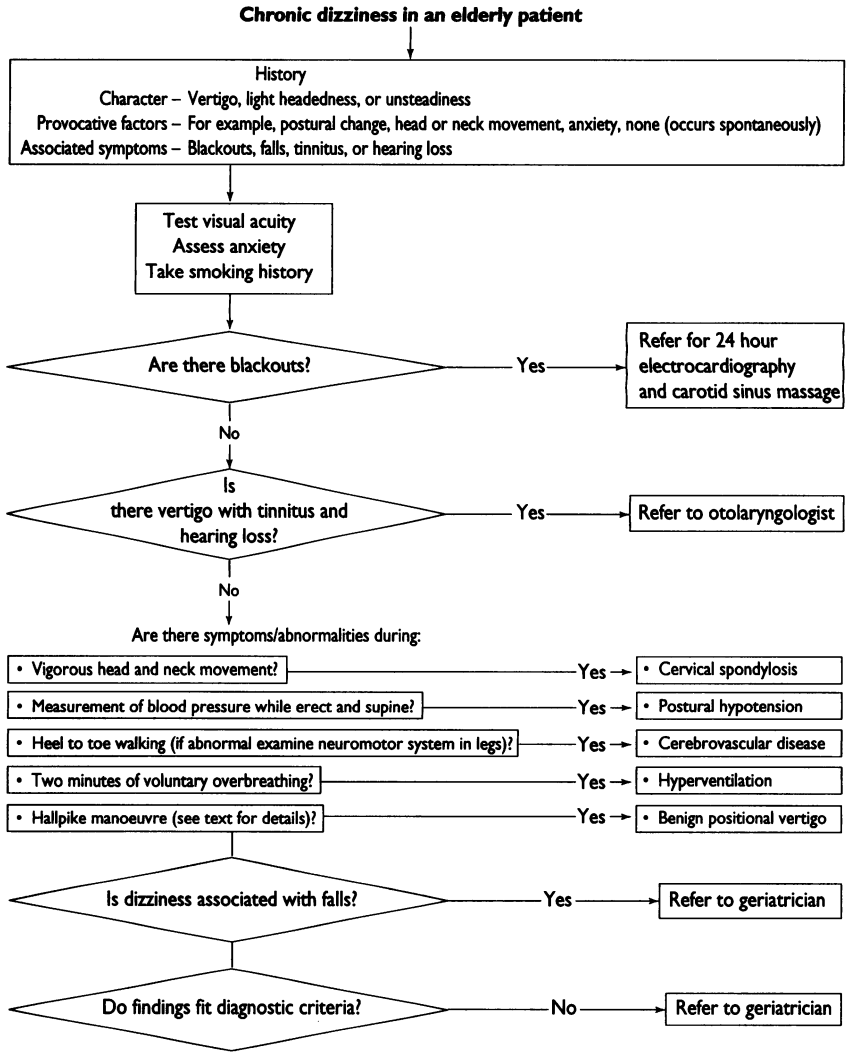

Fig 1—*Algorithm for evaluation of cause of dizziness in elderly patients in general practice*

The frequency of symptoms on postural change and the lack of correlation with any drop in blood pressure has been previously noted.[25] This may be due to an impairment in cerebral blood flow that can occur without a drop in systemic blood pressure on postural change.[26] Interestingly, postural symptoms are more strongly associated with a history of falling and impaired functional status than postural hypotension.[25]

Diagnostic criteria for causes of dizziness

Benign paroxysmal vertigo	Brief episodes of vertigo on change of position with a positive response to the Hallpike manoeuvre[9]
Cervical spondylosis	Symptoms on head or neck movement with reduced range of neck movement[7]
Postural hypotension	Fall of 20 mm Hg in systolic pressure or of 10 mm Hg in diastolic blood pressure one minute after standing from the supine position with associated symptoms[17]
Central vascular disease	Unsteadiness with or without light-headedness in association with an abnormal gait (marche à petits pas) and increased reflexes and tone, with or without loss of power[18]
Anxiety or hyperventilation	Anxiety score of more than 8 on hospital anxiety and depression scale with or without reproduction of symptoms on hyperventilation[7 19]
Poor vision	Visual acuity reduced to less than 6/9 in both eyes
Other	For example, osteoarthrosis, parkinsonism, peripheral neuropathy
No diagnosis possible	

Key messages

- Dizziness can be diagnosed in most elderly people on the basis of findings in the neurological and locomotor systems, supplemented by simple dizziness provocation testing
- Expensive investigations are rarely helpful in the diagnosis of dizziness in elderly people
- The most common causes of dizziness in older people are central vascular disease and cervical spondylosis
- Poor vision and anxiety often accompany but are rarely the sole cause of dizziness
- These findings point to a definitive role for the general practitioner in the assessment of dizzy elderly patients

ADVICE TO GENERAL PRACTITIONERS

As a result of this study, general practitioners should feel confident that a clinical assessment, including the provocation of dizziness, will identify the causes of dizziness in most of their elderly patients (fig 1). Evidence of poor vision, anxiety, and smoking should be sought and actively managed. Much of such an assessment could be performed by a practice nurse.

We think that patients with blackouts and those whose symptoms and signs do not fit clearly defined diagnostic criteria should be referred. Given the low frequency with which vestibular disease occurred, otolaryngological assessment will rarely be fruitful. Geriatricians, with their experience of multisystem disease, may be more appropriate specialists to perform further assessment.

FUTURE RESEARCH

The results of this study should herald a shift away from protracted investigation programmes for dizzy elderly subjects. Now that we have clearly defined diagnostic criteria that identify the causes of dizziness in most elderly people, future research should be directed at improving management. As many of the causative conditions can only be controlled symptomatically rather than cured, rehabilitation seems the best option. Elderly people's balance can be improved by training,[27 28] and new techniques such as posturography with visual feedback and vestibular rehabilitation should be examined. Given the frequency with which dizzy people fall, such research is a matter of urgency.

We thank the volunteers for their help and patience, and Dr Scott Murray, department of general practice, University of Edinburgh, and Dr Isobel Wilson, Morningside Medical Practice, Edinburgh, for their useful comments.

Funding: Research into Ageing (ref 9/110); Chief Scientist's Office, Scottish Home and Health Department (ref K/MRS/50/C1739).

Conflict of interest: None.

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(Accepted 7 August 1996)

Doctors' retainer scheme in Scotland: time for change?

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Abstract

***Objectives*—To describe the present doctors' retainer scheme in Scotland and ascertain the need for change.**

***Design*—Semistructured postal questionnaires to current and past members of the doctors' retainer scheme and general practitioner employers.**

***Setting*—Scotland, October to December 1994.**

***Subjects*—152/160 current and 104/124 former members responded together with 101/118 general practitioner employers.**

***Results*—93% of members currently working in general practice were either vocationally trained or had previously worked as principals. 84% of current members held postgraduate qualifications. 73% of former members had left the scheme within 4 years and 72% of current members had been with the scheme for 4 years or less. 66% of current members said that the scheme prevented them from leaving medicine. Both members and employers were dissatisfied with the current limit of two working sessions per week, 77% of employers wanting it increased. 61% of current members would not have joined the scheme if suitable part time work had been available and 46% of those would have preferred to work flexibly, up to 5 sessions per week. 52% of members do not receive BMA rates of pay and, of those, 46% work more than 3.5 hours per session.**

***Conclusion*—The scheme appears to be appreciated and would be more so if inconsistencies in pay and conditions were addressed. An increase in the permitted number of weekly sessions would enable these highly qualified doctors to maintain their skills and confidence.**

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BMJ 1996;**313**:792–4

Introduction

Half of medical graduates are now women and there is an increasing demand for part time training and work from both men and women.[1 2] Opportunities are still limited, however, and this study aimed to explore the existing and potential usefulness of the doctors' retainer scheme, which has been in existence in Scotland since 1972 (and also in the rest of the UK).

The scheme was established to "encourage doctors who were temporarily unable to practise because of domestic commitments to remain in touch with medical activity and continue their training in order eventually to return to substantial practice." The conditions of membership have remained unchanged[3 4] and are:

Work up to a maximum of 2 paid sessions per week.

Receive in addition to salary an annual retainer fee (currently £290) paid by the health board.

Keep up registration with General Medical Council and belong to a defence organisation.

Subscribe to a professional journal.

Attend at least 7 educational sessions a year.

Work at least 12 paid service sessions per year.

In general practice one session a week is reimbursed to practices by health boards. The present level of reimbursement is £40.50 per session.

Recently, the scheme has been felt to be in need of modernisation,[5 6] and in 1992 the Advisory Committee on Medical Establishment recommended that doctors in the scheme should be allowed to work up to four sessions per week and do controlled short term locum work; that the retainer fee should be updated annually to cover expenses; and that time spent in the scheme should be limited to five years.[7] There is no indication that these recommendations will be implemented, and there has been no large study to help shape policy. We therefore carried out a structured inquiry of both present and past members of the scheme in Scotland and of employers.

Methods

Our aims were to: (*a*) describe the characteristics of the current membership, to assess training needs; (*b*) acquire data on length of membership and subsequent career development of former members; (*c*) gather information on pay and conditions and other factors affecting satisfaction with the scheme; and (*d*) seek suggestions for improving the scheme.

Names and addresses of current members were easily obtained from the five Scottish postgraduate centres. It was harder to identify former members because the length of time that records are kept varies between the five centres, and our data are therefore incomplete. Current addresses of former members were found using the *Medical Directory*, telephone directories, and information from staff in postgraduate centres.

Semistructured postal questionnaires were sent to current members and those former members who could