

The triage of stroke rehabilitation

W. M. GARRAWAY,¹ A. J. AKHTAR,² D. L. SMITH,² AND M. E. SMITH¹

From ¹the Department of Community Medicine, University of Edinburgh, and ²the Geriatric Unit, Royal Victoria Hospital, Edinburgh

SUMMARY In this paper we describe the use of triage to select patients for a trial in which a comparison was made of the effectiveness of a stroke unit and medical units in the rehabilitation of acute stroke. Completing the triage for hospital admission of stroke enabled an estimate to be made of the size of a stroke unit per unit of population.

The humanitarian spirit in medicine requires that the maximum effort be exerted for all patients, even when a proportion of them will respond poorly to such efforts. This is an appropriate approach when services and facilities are abundant. But when time or resources are scarce, it is more rational to concentrate on the patients who are likely to respond most readily, while providing less intensive care for those who are likely to be poor responders or whose condition does not warrant intensive treatment.¹ This concept of triage has been widely used by military surgeons, and in civilian practice it has been suggested as a way of sorting out casualties after a major disaster.² It has subsequently been applied to the provision of medical care in a developing country³ but there is a surprising lack of reports on the use of triage in the management of chronic disease. In this paper we present the use of triage as a way of identifying patients for a controlled trial in which the effectiveness of a stroke unit is compared with that of medical units in rehabilitating elderly patients with acute stroke. The preliminary results of the study have been published.⁴ We now report the results of a survey undertaken to complete the triage of stroke rehabilitation which has enabled an estimate to be made of the size of a stroke unit per unit of population.

Methods

THE HYPOTHESIS

The study was a randomised controlled trial designed to test the hypothesis that the proportion of patients who could be returned to independence after admission to a stroke unit would be higher than that of patients who were admitted to medical units.

THE ALLOCATIONS

The traditional way of managing acute stroke in Edinburgh is by emergency hospital admission to a

medical unit shortly after onset for investigation, diagnosis, and treatment. Admissions are accomplished through an Emergency Bed Bureau, run by the Lothian Health Board, which facilitates admissions on behalf of referring general practitioners (GPs). Each medical unit has access to a full range of diagnostic facilities for investigating stroke, as well as access to rehabilitation staff and facilities either within its parent institution or in an affiliated hospital.

A stroke unit was created by changing the function of a ward of 15 beds within the Geriatric Unit at the Royal Victoria Hospital, Edinburgh. A rehabilitation team was established from existing staff already working in the hospital under the direction of one of us (A.J.A.) who took no part in the assessment of outcome. No new staff were appointed specifically to the stroke unit and particular emphasis was placed on not attempting to achieve unrealistic levels of staffing which could not be attained elsewhere. The stroke unit had been in operation for one year before the study commenced and had evolved an operational policy, which was initially based on the work of Isaacs.⁵

PATIENTS

Patients were eligible for the study if they were resident within the City of Edinburgh or Musselburgh. This provided a defined population of 470 000. The demographic characteristics of this population were similar to those of Scotland as a whole, except that the study population contained a higher proportion of elderly persons. Hospital care for stroke was similar among hospitals serving the defined population compared with all Scottish hospitals (Scottish Hospital Inpatient Files, 1979, unpublished observations).

All general practitioners (GPs) were contacted, mostly through personal visits by one of the investigators, but also by explanatory tours of the

stroke unit and other stroke-related meetings. Of the 277 practising doctors serving the catchment population at the beginning of the study, 275 agreed to notify appropriate patients, using the definition of stroke as the onset of a focal neurological deficit of presumed vascular origin present for at least six hours but no longer than three days. There was no upper age limit but a lower age limit of 60 was employed because the stroke unit was operating under the auspices of a geriatric unit. Practitioners were encouraged to notify all patients who appeared to be suitable. Medical staff from the study were on call 24 hours a day to undertake home visits to confirm the practitioner's diagnosis and establish clinical eligibility to participate. Only first strokes were considered for the study.

SELECTION CRITERIA

Stroke presentations seen on home visits were divided into a triage of three bands: 'upper', 'middle', and 'lower', using selection criteria derived from previous studies of the natural history of stroke.⁶⁻⁹ Patients placed in the middle band of strokes using the criteria illustrated in Table 1 were eligible for the study. The upper band contained patients who were likely to do poorly whether they were rehabilitated or not. The lower band contained patients who were likely to recover spontaneously and who would not require a sustained period of rehabilitation. Concentrating on the middle band of strokes allowed a more realistic comparison to be obtained of the relative effectiveness of a stroke unit and medical units in rehabilitating those patients whose prognosis in terms of years of life was good, but who were likely to have residual disability which would require ongoing support. Five hundred and eighty-four patients received domiciliary visits. The mean delay before the home visit to establish clinical eligibility began was 40 minutes after notification. Clinical

examination carried out by a member of the medical staff from the study to establish the patients' positions in the triage took a mean period of 20 minutes. Three hundred and eleven patients were assessed as being in the middle band and all agreed to participate in the study. The mean duration of stroke in these patients from onset to the time of admission to the study was 25.8 hours.

RANDOMISATION

The options were allocated in a series of sealed envelopes at the beginning of the study, using a system of restricted randomisation, and were unknown to the investigators until a patient was accepted into the trial. This was accomplished by opening the envelopes in numerical sequence during the domiciliary visit, after patients' eligibility to participate had been established. Patients were then either admitted directly to the stroke unit or referred immediately to the Emergency Bed Bureau for placement in a medical unit. The management of patients during the acute phase of rehabilitation was determined by the staff of the appropriate unit; no attempt was made to restrict the clinical freedom of any medical, nursing, or therapy staff.

OUTCOME

The outcome of the acute phase of rehabilitation was assessed when discharge was imminent, or at a cut-off point of 16 weeks after admission. The assessment was made using a purpose-built Activities of Daily Living (ADL) unit designed to reproduce the home or other circumstances to which the patients were being discharged. The aids or adaptations which had been prescribed for patients were included in the replication of the circumstances at discharge. Patients were assessed on their ability to perform the seven basic activities of getting in and out of bed, dressing, indoor mobility, toileting and personal hygiene, cooking a simple hot meal, feeding, and control of environment. Patients were classified as independent if they could perform all seven activities without human assistance and dependent if they required human assistance to complete at least one activity or if they failed to carry out the activity altogether. A description of the planning and use of the ADL unit has been reported elsewhere.¹⁰

COMPLETING THE TRIAGE

All study patients placed in the upper and lower bands were followed up and their outcome noted at the time of hospital discharge. In order to complete the picture of triage, it was necessary to look for all cases of stroke which were not referred to, or accepted by, the study. It was particularly important to identify middle band strokes who were admitted to

Table 1 *The triage used to select strokes for the study*

	<i>STROKE PRESENTATION</i>	<i>PROGNOSIS</i>	<i>ELIGIBILITY</i>
UPPER BAND	Unconscious at onset	Bad for survival	Excluded
	Already dependent in daily living activities	Likely to remain dependent	
MIDDLE BAND	Conscious at onset	Good for survival	Included
	Established or developing hemiplegia present	Spontaneous recovery of independence unlikely	
LOWER BAND	Conscious at onset	Good for survival	Excluded
	Able to walk without human assistance	Spontaneous recovery of independence likely	

hospital directly by their GPs or through accident and emergency departments. The identification of all cases of stroke was limited to those admitted to hospital during the years 1976–77, although the intake period of the controlled trial extended from 5 October 1975 to 30 April 1978. Accordingly, only the patients admitted to the controlled trial during 1976–77 are included in the results presented in this paper. All stroke admissions among patients aged 60 and over from the defined population were identified from case listings of Scottish Hospital Inpatient Statistics. A one-in-three random sample was drawn and the medical records of these patients examined to determine where they would have been placed in the triage and to ascertain their outcome on hospital discharge. This was undertaken using the Rankin Disability Scale, a more subjective assessment of stroke dependency widely used in other studies based on reviews of medical records, which was compatible with the ADL classification used in the controlled trial.¹¹ Seventeen medical records could not be traced. It was not possible to establish the position in the triage of stroke patients from the defined population who were retained at home throughout by GPs.

Results

INCIDENCE OF STROKE

The total number of strokes among persons aged 60 and over in the defined population who were admitted to hospital in 1976–77 was 1429. Upper band strokes accounted for 43% of all strokes, middle band strokes 24%, and lower band strokes 33%. Seventy-one per cent of all middle band strokes were referred to the study, compared with 18% of upper and 23% of lower band strokes.

The average annual age- and sex-specific incidence rate for hospital admission of stroke was 7.3 per 1000 persons aged 60 and over. This rate comprised 3.1, 1.8, and 2.4 per 1000 person-years for upper, middle, and lower band strokes respectively. Middle band strokes had a lower average annual incidence rate for hospital admission in the age-specific groups of 60–69, 70–79, and 80 and over in both sexes in

comparison with either upper or lower band strokes. With the exception of upper band strokes in the 60–69 age group, the rates were higher in men than women in all age-specific groups.

TYPE OF HOSPITAL ADMISSION

Before the study began, it was thought that the Emergency Bed Bureau of the Lothian Health Board was notified about virtually all elderly stroke patients who were admitted to hospital. Table 2 shows the extent to which this actually occurred. Just over half (55%) of all cases were referred through the Emergency Bed Bureau. The remainder were either referred directly to hospital by GPs (19%) or brought to accident and emergency departments (18%). A further group (7%) of predominantly upper band strokes were already in hospital for some other reason when the stroke occurred. There were marked differences in the proportions of each band of stroke who were admitted to hospital by different routes. Four out of every five middle band strokes were referred to hospital through the Emergency Bed Bureau, whereas only a small proportion of middle band strokes were admitted by GPs directly to hospital or taken to accident and emergency departments by ambulance.

DURATION OF HOSPITAL STAY

The mean duration of hospital stay for each band of stroke is presented in Table 3. There was a significant

Table 3 Duration of hospital stay

	BAND OF STROKE		
	Upper	Middle	Lower
Admitted to the study			
Stroke Unit	—	55 ± 3	—
Medical Units	—	75 ± 7	—
Not eligible to participate	70 ± 12	—	41 ± 7
Not referred to the study	41 ± 6	82 ± 17	24 ± 3

Figures are mean (±SE) duration of hospital stay (days).

difference ($p < 0.01$) in hospital stay among middle band strokes who entered the study, according to whether they were in the stroke unit or in a medical

Table 2 Type of hospital admission for stroke

	BAND OF STROKE						Total %	(No.)
	Upper %	(No.)	Middle %	(No.)	Lower %	(No.)		
Emergency Bed Bureau	42	(259)	80	(277)	53	(251)	55	(787)
GP direct	20	(123)	8	(27)	24	(114)	19	(264)
Ambulance (999 call)	23	(141)	7	(24)	20	(93)	18	(258)
Patients already in hospital	14	(84)	3	(9)	2	(12)	7	(105)
Other	1	(6)	2	(6)	1	(3)	1	(15)
TOTAL	100	(613)	100	(343)	100	(473)	100	(1429)

unit. It is of interest to note that the duration of stay of middle band strokes who were not referred to the study was similar to that of patients who were allocated to medical units. Differences occurred in the duration of stay of upper and lower band strokes according to whether they were or were not referred to the study. The much lower mean stay of upper band strokes who were not referred (41 days) is a reflection of the poor conscious level of a high proportion of patients in this group. Conscious level at onset is the most important predictor of early mortality following stroke. Similarly, the high proportion of lower band strokes who presented with transient ischaemic attacks and were not referred accounts for their much lower duration of stay (24 days) compared with lower band strokes who were referred. The distribution of upper, middle, and lower band strokes was remarkably similar between medical units in the different participating hospitals.

OUTCOME

Table 4 provides a summary of the functional outcome at hospital discharge according to whether patients were admitted to hospital without being referred to the study, were seen but found to be ineligible, or were admitted to the study. The difference in functional outcome between the stroke unit and medical units enabled the hypothesis that a higher proportion of patients can be returned to independence after admission to a stroke unit rather than medical units to be accepted. The proportions of independent and dependent patients were similar among those admitted to the study who were allocated to medical units and patients with middle band strokes who were admitted to hospital without being referred to the study. A higher proportion of patients in the upper band who were not referred to the study died, and a higher proportion in the lower band who were not referred were classified as independent compared with patients who were seen but rejected. These differences could have been due to the low proportion of patients with poor conscious levels or with transient ischaemic attacks who were referred to the study by GPs.

THE SIZE OF A STROKE UNIT

Basing the study on hospital admissions from a defined population, and completing the triage of stroke rehabilitation for all such admissions, enabled an estimate to be made of the number of beds which would be required for a stroke unit per unit of population. The steps taken in estimating the size of a stroke unit required to admit acute strokes in the middle band is presented in Table 5. In this it is assumed that the same criteria for placement in the middle band of stroke are used, all middle band strokes occurring in the defined population are referred to hospital, the same case fatality ratio was present, the same mean duration of stay which applied to the stroke unit in the study occurred, and the bed occupancy rate was that which applied to medical units in Scotland during 1976-77.¹² If these assumptions are applied, the number of beds which would be required for a stroke unit in a standard population would be four beds for every 10 000 persons aged 60 and over, or 15 beds for a stroke unit located in a district general hospital serving a population of 250 000, 18% of whom were aged 60 or over.

Discussion

A group of patients have been identified as those likely to derive the most benefit from intervention in the provision of rehabilitation services after acute stroke. The development of a system of triage which defined a middle band of stroke was probably an important factor in being able to accept the hypothesis that a stroke unit could return a higher proportion of patients to independence after onset of acute stroke than could medical units. This could have important implications for the management of acute stroke in clinical practice.

Validation of the selection criteria used to separate patients into upper, middle, and lower bands of stroke was possible because the outcome assessment used in the study was compatible with a disability scale which had previously been used to estimate functional outcome from patients' medical records.

Table 4 Outcome at the time of hospital discharge

CATEGORY OF STROKE		INDEPENDENT		DEPENDENT		DEAD		TOTAL	
		No.	(%)	No.	(%)	No.	(%)	No.	(%)
UPPER BAND	Seen, not eligible	7	(6)	37	(36)	60	(58)	104	(100)
	Not referred to the study	21	(4)	75	(15)	405	(81)	501	(100)
MIDDLE BAND	Stroke unit allocation	64	(52)	39	(31)	21	(17)	124	(100)
	Medical unit allocation	38	(32)	49	(41)	33	(27)	120	(100)
	Not referred to the study	33	(33)	45	(46)	21	(21)	99	(100)
LOWER BAND	Seen, not eligible	75	(72)	13	(12)	17	(16)	105	(100)
	Not referred to the study	321	(88)	27	(7)	15	(5)	363	(100)

Table 5 The size of a stroke unit

Average annual incidence rate of middle band stroke in persons aged ≥ 60 = 1.8 per 1000 person-years ^a	
Assuming the mean hospital stay in the stroke unit = 55 days	
Assuming the bed occupancy ratio = 0.85 ^b	
Number of beds required for a stroke unit to serve a population of 10 000 persons aged ≥ 60	
=	$\frac{55 \times 1.8 \times 10}{7 \times 52 \times 0.85} = 4 \text{ beds}^c$

^a Age and sex adjusted to the Scottish population aged 60 and over at the 1971 census.

^b Based on bed occupancy of medical units in Scotland, 1976.

^c Rounded up to the nearest whole number.

Comparing the outcome of middle band strokes with upper and lower band strokes at the time of hospital discharge indicated that the criteria used in the triage were broadly correct. But further development of the triage is required in order to reduce or eliminate the inconsistencies which resulted in the outcome of 5% of upper band strokes being independent and 15% of lower band strokes not surviving or remaining dependent. This might be achieved by refining the selection criteria used or by altering the timing at which the triage was applied. The triage was applied in the study at a mean period of 26 hours after stroke onset in order to satisfy the requirements of GPs and hospital staff who participated in the study. A delay of three or four days would probably have eliminated or greatly reduced the inefficiency of the triage process, because more strokes would have stabilised and certain patients proved their ability to survive. This would also be a better time to select patients for admission to a stroke unit because it is unlikely that a domiciliary service similar to that used to admit patients to the study could be contemplated in routine clinical practice. It would also enable the present desirable policy of admitting acute strokes to medical units in order to confirm the diagnosis and initiate relevant treatment for concomitant conditions to continue.

Including epidemiology in the study of the working of health services enables the results to be applied to whole populations once it has been demonstrated that changes in the organisation or use of health services can alter the natural history of disease for the better. Completing the triage of stroke rehabilitation for all hospital admissions from the defined population has enabled an estimate to be made of the number of beds which would be required for a stroke unit to serve a standard population. But it must be emphasised that this estimate does not take into account any strokes who were managed at home throughout by GPs but who might have satisfied the

criteria for admission to the stroke unit. Recent studies have estimated that, overall, 70–80% of all stroke patients may be admitted to hospital.^{13–15} These estimates do not provide any insight into the likely number of middle band strokes who might have been eligible for the study, but were retained at home. But the widespread dissemination of information and almost universal collaboration which the study received from GPs, and the availability of an efficient domiciliary service on call 24 hours a day to assess potential middle band strokes on behalf of GPs, make it unlikely that many such patients were missed. Confirmation of the incidence rate of middle band strokes being admitted to hospital in other centres, and of the frequency and distribution of the three bands of stroke occurring in persons aged under 60, would be useful additions to the concept of triage which was developed for this study.

The introduction and almost universal acceptance of special units for the management of acute myocardial infarction has been widely criticised and it has been emphasised that the position today would have been clearer if some randomised controlled trials had been carried out when these units were first developed.¹⁶ In this context, it is important for a more scientific evaluation to be carried out before stroke units obtain widespread acceptance in the management of acute stroke. This must include a thorough appraisal of which patients are likely to derive the most benefit from admission to stroke units, and the application of triage might provide a practical solution to this problem.

We thank our co-investigators, Dr. Lisbeth Hockey and Dr. R. J. Prescott, and all members of the research team who worked on the project from 1974–80; the members of the Division of Medicine, North and South Lothian Districts; the staff of the Geriatric Unit, Royal Victoria Hospital; the staff of the Emergency Bed Bureau, Lothian Health Board; the GPs; the hospital medical records staff; the staff of the Information Services Division, Common Services Agency; and the Department of Medicine (Western General Hospital).

We acknowledge the financial support given to the study by the Scottish Home and Health Department and Lothian Regional Council.

Reprints from Dr. W. M. Garraway, Department of Community Medicine, University of Edinburgh, Usher Institute, Warrender Park Road, Edinburgh EH9 1DW.

References

- ¹Wylie CM. Age and the rehabilitative care of stroke. *J Am Geriatr Soc* 1968; **12**: 763–70.
- ²Fairley J. Mass disaster schemes. *Br Med J* 1969; **4**: 551–3.
- ³Shattock FM. Application of triage to the provision of medical care in developing countries. *Lancet* 1970; **i**: 461–3.
- ⁴Garraway WM, Akhtar AJ, Prescott RJ, Hockey L. Management of acute stroke in the elderly: preliminary results of a controlled trial. *Br Med J* 1980; **280**: 1040–3.
- ⁵Isaacs B. Five years' experience of a stroke unit. *Health Bull (Edinb)* 1977; **35**: 93–8.
- ⁶Marquardsen J. *The Natural History of Acute Cerebrovascular Disease*. Copenhagen: Munksgaard, 1969.
- ⁷Eisenberg H, Morrison JT, Sullivan P, Foote FM. Incidence and survival rates in a defined population, Middlesex County, Connecticut. *JAMA* 1964; **189**: 107–12.
- ⁸Katz S, Ford AB, Chinn AB, Newill VA. Prognosis after strokes. Part II: Long-term course of 159 patients. *Medicine (Baltimore)* 1966; **45**: 236–46.
- ⁹Whisnant JP, Matsumoto N, Elveback E. Transient cerebral ischaemic attacks in a community—Rochester, Minnesota, 1955 through 1969. *Mayo Clin Proc* 1973; **48**: 194–8.
- ¹⁰Smith ME, Garraway WM, Akhtar AJ, Andrews CJA. An assessment unit for measuring the outcome of stroke rehabilitation. *British Journal of Occupational Therapy* 1977; **40**: 51–3.
- ¹¹Rankin J. Cerebral vascular accidents in patients over the age of 60. II: Prognosis. *Br Med J* 1957; 200–15.
- ¹²Information Services Division, Common Services Agency for the Scottish Health Service. *Scottish Health Statistics 1977*. Edinburgh: HMSO, 1978.
- ¹³Brocklehurst JC, Andrews K, Richards B, Laycock PJ. How much physical therapy for patients with stroke? *Br Med J* 1978; **i**: 1307–10.
- ¹⁴Weddell JM, Beresford SAA. *Planning for Stroke Patients. A four-year Descriptive Study of Home and Hospital Care*. London: HMSO, 1979.
- ¹⁵Garraway WM, Whisnant JP, Kurland LT, O'Fallon WM. Changing pattern of cerebral infarction: 1945–74. *Stroke* 1979; **10**: 657–63.
- ¹⁶Rose G. The contribution of intensive coronary care. *Br J Prev Soc Med* 1975; **29**: 147–50.