Age and Ageing 2002; **31:** 365–371

What are the components of effective stroke unit care?

PETER LANGHORNE, ALEX POLLOCK IN CONJUNCTION WITH THE STROKE UNIT TRIALISTS' COLLABORATION*

Academic Section of Geriatric Medicine, Level 3, Centre Block, Royal Infirmary, Glasgow G4 OSF, UK

Address correspondence to: P. Langhorne. Fax: (+44) 141 211 4944. Email: P.Langhorne@clinmed.gla.ac.uk

Abstract

Background: the effectiveness of organized inpatient (stroke unit) care has been demonstrated in systematic reviews of clinical trials. However, the key components of stroke unit care are poorly understood.
Methods: we conducted a survey of recent trials (published 1985–2000) of a stroke unit/ward which had demonstrated a beneficial effect consistent with the stroke unit systematic review.
Results: we identified 11 eligible stroke unit trials of which the majority described similar approaches to i) assessment procedures (medical, nursing and therapy assessments), ii) early management policies (e.g. early mobilization; avoidance of urinary catheterization; treatment of hypoxia, hyperglycaemia and suspected infection), iii) ongoing rehabilitation policies (e.g. co-ordinated multidisciplinary team care, early assessment for discharge).
Conclusions: this survey provides a description of stroke unit care which can serve as a benchmark for general stroke patient care and future clinical research.

Keywords: *stroke unit, care pathway, rehabilitation, randomized trial, systematic review*

Introduction

The management of stroke patients in hospital entails a complex package of care, much of which is difficult to evaluate in clinical trials. Clinical guidelines often provide advice on various aspects of general patient care (such as the management of blood pressure, policies for mobilization) which is not based on reliable direct evidence from randomized trials. Recent systematic reviews have demonstrated that stroke patients who receive a package of organized inpatient (stroke unit) care are more likely to survive, return home and regain independence than those who receive conventional care in general wards [1]. These benefits were observed across a broad range of patient groups [1].

This important result raises the questions of how stroke units improve patient outcomes and how clinicians and healthcare planners can implement effective stroke unit care. We have previously shown [2] that stroke unit care probably improves patient outcomes by minimizing preventable complications of stroke and enhancing independence in functional activities. However, our previous attempts to describe stroke unit care have either included rather broad superficial descriptions [3] or more detailed analysis of individual examples [4]. In this paper we aim to survey in a systematic way the processes of care adopted by those stroke units for which there is reasonably reliable evidence of effectiveness, and to explore the hypothesis that there may be common codes of practice which are characteristic of effective stroke unit care.

Methods

Identification of trials

We first sought to identify controlled clinical trials of contemporary stroke units using the most recent Cochrane systematic review of organized (in-patient) stroke unit care [1]. This is based on both published and

*The Stroke Unit Trialists' collaboration consisted of: K. Asplund (*Umea, Sweden*); P. Berman (*Nottingham, UK*); C. Blomstrand (*Goteborg, Sweden*); M. Dennis (*Secretariat*); J. Douglas (*Secretariat*); T. Erila (*Tampere, Finland*); M. Garraway (*Edinburgh, UK*); E. Hamrin (*Uppsala, Sweden*); G. Hankey (*Perth, Australia*); M. Ilmavirta (*Tampere, Finland*); B. Indredavik (*Trondheim, Norway*); L. Kalra (*Kent, UK*); M. Kaste (*Helsinki, Finland*); P. Langhorne (*Co-ordinator*), S. O. Laursen (*Svendborg, Denmark*); N. Patel (*Cape Town, South Africa*); H. Rodgers (*Newcastle, UK*); O. M. Ronning (*Akershus, Norway*); J. Sivenius (*Kuopio, Finland*); R. Stevens (*Dover, UK*); S. P. Stone (*London, UK*); A. Svensson (*Goteborg, Sweden*); B. Williams (*Secretariat*); S. Wood-Dauphinee (*Montreal, Canada*).

unpublished information. The criteria for inclusion in our descriptive survey were as follows:

i. Recently published (1985–2000) controlled clinical trials.
ii. Evaluation of a unit based in a discrete ward.
iii. Trial results which demonstrate the same direction of effect as the systematic review of stroke units (i.e. reductions in death, institutionalization or dependency).

Descriptive survey

The data collection schedule was based on pilot work [4], which used a combination of questionnaires and case studies where trialists were asked to describe the process of care for two hypothetical patients. This identified key themes for the current analysis of the process of stroke care:

i. Structure and organization
   - Size and function of the unit
   - Patient inclusion and exclusion criteria
   - Staff mix and staffing levels
   - Multidisciplinary communication
   - Education and training
   - Philosophy and beliefs
ii. Processes of care
   - Medical history and examination
   - Investigations
   - Nursing and therapy assessments
   - Acute management policies
   - Drug therapies
   - Mobilization policies
   - General management policies
   - Discipline-specific interventions
   - Management of complications
iii. Discharge planning and follow up

One researcher (AP) completed the data collection schedule using all the published and unpublished information available to the Stroke Unit Trialists' Collaboration. This information was checked by the second reviewer (PL) and then circulated to the original trialists for checking and completion.

Results

A total of 24 clinical trials were identified in the systematic review [1] of which two are not yet reported and two evaluated the same stroke unit. Ten of the remaining 21 were excluded for the following reasons: not located in a discrete ward (two), none of the main outcomes were consistent with the systematic review (two), published before 1985 (six). Of the remaining 11 stroke units, eight described a comprehensive unit combining acute care and rehabilitation [5–12], two described rehabilitation stroke units [13, 14] and one described a stroke unit continuum with both a comprehensive unit and 'step-down' rehabilitation unit [15].

Our description of stroke unit care used information from the trials of comprehensive units [5–12, 15] to describe the processes of acute management (nine trials in total) which was supplemented with information from the rehabilitation unit trials [13–15] when describing general aspects of patient care and ongoing rehabilitation (11 trials in total).

Structure and organization

Bed numbers

The 11 units were based in departments of geriatric medicine (four), neurology (three) or general medicine (three) or jointly between neurology and geriatric medicine (one). The typical bed numbers and length of stay are shown in Table 1.

Staffing

Characteristic staffing levels are shown in Table 1. These staffing levels must be interpreted with considerable caution as different methods of measurement were used in different settings and there were variable levels of cross-cover with other non-stroke services (e.g. general neurology, geriatric rehabilitation). There also appeared to be variable degrees of interdisciplinary practices with the same tasks being carried out by different staff in different settings.

Patient inclusion and exclusion criteria

Typically unselected patients were admitted with a clinical stroke diagnosis (both ischaemic stroke and primary intracerebral haemorrhage). A minority of units excluded patients with subarachnoid haemorrhage (3/9 units), subdural haemorrhage (3/9), and those with only transient symptoms (2/9). Some (4/9) acute units excluded patients with prior dependency, symptoms lasting more than one week, severe co-morbidity, or unconsciousness. The rehabilitation units excluded patients with reduced consciousness.

Skills, training and communication

All units described a core multidisciplinary team of medical, nursing, physiotherapy, occupational therapy and speech and language therapy staff (Table 2). The majority (7/11) also reported social work input. Multidisciplinary communication typically took place at one formal meeting per week plus one or two informal meetings per week, the latter often being attended by patients and family. The majority of

Table 1. Resource characteristics of the stroke units described

	Comprehensive unit (acute and rehabilitation)	Rehabilitation unit (rehabilitation only)
Bed numbers	6–12	13–15
Approximate proportion of stroke patients eligible for admission	Most—all	Half
Length of stay (median and range)	24 (8–52) days	52 (27–76) days
Proportion of patients discharged to a rehabilitation facility	Some	None
Indicative staffing levels for a 10 bed stroke unit		
Medical (all grades)	1–2	0.6
(senior)	0.5–1.0	0.2–0.3
(junior)	0.5–1.5	0.4
Nursing—estimated number per daytime shift (all grades)	3–5	3–4
(trained)	2–3.5	2–2.5
(assistant)	0–1.5	1–1.5
Physiotherapy (trained and assistant)	1.2–1.7	1–2
Occupational therapy (trained and assistant)	0.6–1.7	1–1.3
Speech and language therapy	0.25–0.75	0.2–0.6
Social work	0.6	0.4–0.6

Staffing levels are standardized to notional 10 stroke unit beds and presented as a representative range of whole time equivalents of staff.

Table 2. Staff skills, training and communication

	Most units (67–100%)	Many units (34–66%)	Some units (10–33%)
Staff skills	Medical expertise in stroke and/or rehab. Nursing expertise in stroke and/or rehab.		
Members of the 'core' MDT	Medical Nursing Physiotherapy Occupational therapy Speech and language therapy	Social work	Other (clinical psychology, psychiatry)
MDT communication and practice	Formal MDT meeting once per week Nursing practice closely co-ordinated with MDT Informal MDT meeting 1–3 times per week Carers involved in rehabilitation		MDT assessment prior to first MDT meeting MDT meeting attended by patient and/or carers Attended by patient and/or carers
Goal setting	By staff (MDT)		By staff with formal involvement of patient
Information provided to patients and carers	Stroke disease Rehabilitation and recovery		
Education and training	Education programme for staff		

MDT = multidisciplinary team.

units described goal setting being carried out by the multidisciplinary team.

Patients and family were routinely provided with information on stroke disease, rehabilitation, and recovery. All units described educational and training programmes for staff which varied from regular seminars on stroke care to workshops and training days several times per year. Monitoring of service quality included regular audit, surveys of patient satisfaction, and feedback from stroke support groups.

Processes of care

Acute assessment and investigation

Table 3 summarizes the acute assessment and investigation strategies in the stroke unit trials. Units which admitted patients acutely typically reported the use of a standard clinical history and examination, routine biochemistry and haematology investigations, ECG and CT scanning plus the use of carotid Doppler ultrasound

Table 3. Details of assessments carried out in stroke units

	Most units (67–100%)	Many units (34–66%)	Some units (10–33%)
Clinical assessment	History and examination		
Routine investigation (all patients)	Biochemistry Haematology ECG CT scanning		Chest X-ray
Selective investigation (selected patients only)		Carotid doppler ultrasound Echocardiography and/or cardiology assessment	MRI scanning Angiography
Nursing and therapy	General nursing needs (including vital signs)	Early physiotherapy and occupational therapy assessment Pressure areas (including pressure risk scores) Swallow testing Fluid balance Assessment scales (Scandinavian stroke scale, Barthel index)	

and echocardiography in selected patients. Data were less complete on early nursing and therapy assessments but a variety of assessments were reported (Table 3) including the use of a neurological impairment scale (such as the Scandinavian Stroke Scale) to monitor progress over the first few days.

Early management (days 0–3)

Table 4 summarizes the early management strategies. Early mobilization was reported in almost all studies usually beginning on the day of admission. Other common measures were the careful management of food and fluid intake (often including the routine use of intravenous saline in the first 12–24 hours), the use of insulin for hyperglycaemia, the selective use of oxygen, cautious reduction of very elevated blood pressure, and the use of paracetamol for pyrexia. Prevention and management of complications included the use of compression stockings, antibiotics for suspected infection, avoidance of urinary catheters, and treatment of constipation.

General patient management

Table 4 summarizes aspects of general patient management (i.e. policies throughout the whole period of inpatient care). Physiotherapy usually began early with a variety of treatment approaches being used. The median amount of physiotherapy reported was 45 minutes per patient per weekday. Occupational therapy also began early using a variety of approaches with a median amount of approximately 40 minutes per patient per weekday. Speech and language therapy tended to focus on the monitoring and treatment of dysphagia and communication problems. Social work and clinical psychology input was also reported in some trials.

Discharge planning

A variety of approaches to discharge planning were described. Most units (9/11) made early contact with patients and carers to make appropriate comprehensive assessments for hospital discharge. A minority (4/11) reported a pre-discharge home visit or follow up from a stroke liaison nurse.

Figure 1 summarizes the 'typical' pathway of care for stroke patients managed in these stroke units. The features in the centre of the diagram were reported in the majority of trials, those in peripheral boxes featured in a minority of trials only.

Discussion

The present survey did not set out to identify specific effective components of stroke unit care as detailed comparative information on control services was frequently incomplete. However, it could describe the characteristics of stroke units which appeared to provide an effective package of care. This analysis reveals a complex picture of multiple interventions provided by a multidisciplinary team and co-ordinated through regular multidisciplinary meetings. Consistent characteristics appear to be: i) the comprehensive assessment of medical problems, impairments and disabilities, ii) active physiological management (careful management of physiological abnormalities), iii) early mobilization and avoidance of bedrest, iv) skilled nursing care, v) early setting of rehabilitation plans involving carers, vi) early assessment and planning of discharge needs.

This study has a number of limitations. Firstly it is retrospective and hence could be incomplete in some areas. Routine but important activities may have been underreported. For this reason the reported frequency of an activity cannot be used as a reliable indicator of its importance. Secondly it is focused on the views of

Table 4. Management policies in the stroke units

	Most units (67–100%)	Many units (34–66%)	Some units (10–33%)
Medical	Careful fluid management	Routine intravenous saline on admission	
		Selective blood pressure control if very high (e.g. 240/120)	Avoid blood pressure reduction
		Oxygen (for hypoxia, drowsiness or cardiorespiratory disease)	
	Antibiotic for suspected infection	Paracetamol for pyrexia	
		Insulin for hyperglycaemia	
		Heparin for suspected cardioembolism	Heparin for severe hemiparesis
		Aspirin (when haemorrhage excluded)	
Nursing	Careful positioning and handling		Compression stockings
	Early mobilization	Pressure area care	Weekend rehabilitation
	Bowel and bladder care	Avoid urinary catheters	Constipation treatment
	Food and fluid intake management	Routine i.v. saline in first 12–24 hours	
Physiotherapy	Early mobilization	Early involvement of therapist	
		Bobath or functional approach	
		Median of 45 mins (30–60) per day	
Occupational therapy		Early involvement of therapist	
		Bobath or functional approach	
		Median of 40 mins (30–60) per day	
Speech and language therapy		Management of dysphagia and communication problems	
Others			Social work input
			Clinical psychology input

trialists. Therefore this may be a truly factual account of what took place within the stroke units or represent more of a consensus view of what the trialists believed was important. However it is notable that our findings largely agree with direct observational studies of stroke unit practices [16, 17]. Thirdly, we have used some stroke unit trials which predate recent important trials of drug therapies. This may explain the relatively low use of aspirin and more extensive use of heparin than would be expected from current evidence [18, 19]. Fourthly we have used a selected group of stroke units focusing on only eleven examples. The reason for this was to concentrate on examples of geographically discrete stroke units which are relevant to contemporary care and could be replicated in practice. We also wanted to focus on those units which appear to have been effective in that their primary outcome results were consistent with broader stroke unit review [1]. If we had broadened the sample of stroke units described we would have added some older trials and those with more equivocal outcomes. We anticipate the conclusions obtained would have been broadly similar but with more gaps in the data and possibly more diversity of practice described. Finally, we have tried to describe characteristics which are frequently rather ill-defined or have differing definitions. For example early mobilization was universally reported to be important but it was not possible to get a standard definition. Similarly care must be taken when interpreting staffing levels because these were often calculated and described in different ways and with different degrees of cross covering of staff activities and different skill mix characteristics. These data, however, provide a broad indication of typical staffing levels within the stroke units that proved to be effective in clinical trials.

Many of the stroke unit care characteristics described here (e.g. use of CT scanning, multidisciplinary rehabilitation) are already well-established clinical practice in developed countries. However, in many parts of the world planners will have to make difficult decisions when trying to implement effective stroke services—this information should assist with these decisions. The current findings could be criticized as not reflecting the most modern stroke care provided in specialist centres. However much of the empirical justification for specialist stroke care comes from the stroke unit trials [1], and it is important to acknowledge the processes of care which were employed in these trials. Another possible criticism is that many clinical practice guidelines (e.g. [20, 21]) have come to similar conclusions to the current study. However, clinical guideline statements are frequently based only on expert opinion. It is reassuring that our results provide some external empirical support for these guidelines.

Some of the stroke unit characteristics described here contrast with examples of expert opinion and common practice. Early mobilization is a distinctive feature of stroke unit care which contrasts sharply with some expert opinion favouring bedrest during the acute phase of stroke [22]. The liberal use of fluids (oral or intravenous) to prevent dehydration contrasts with a

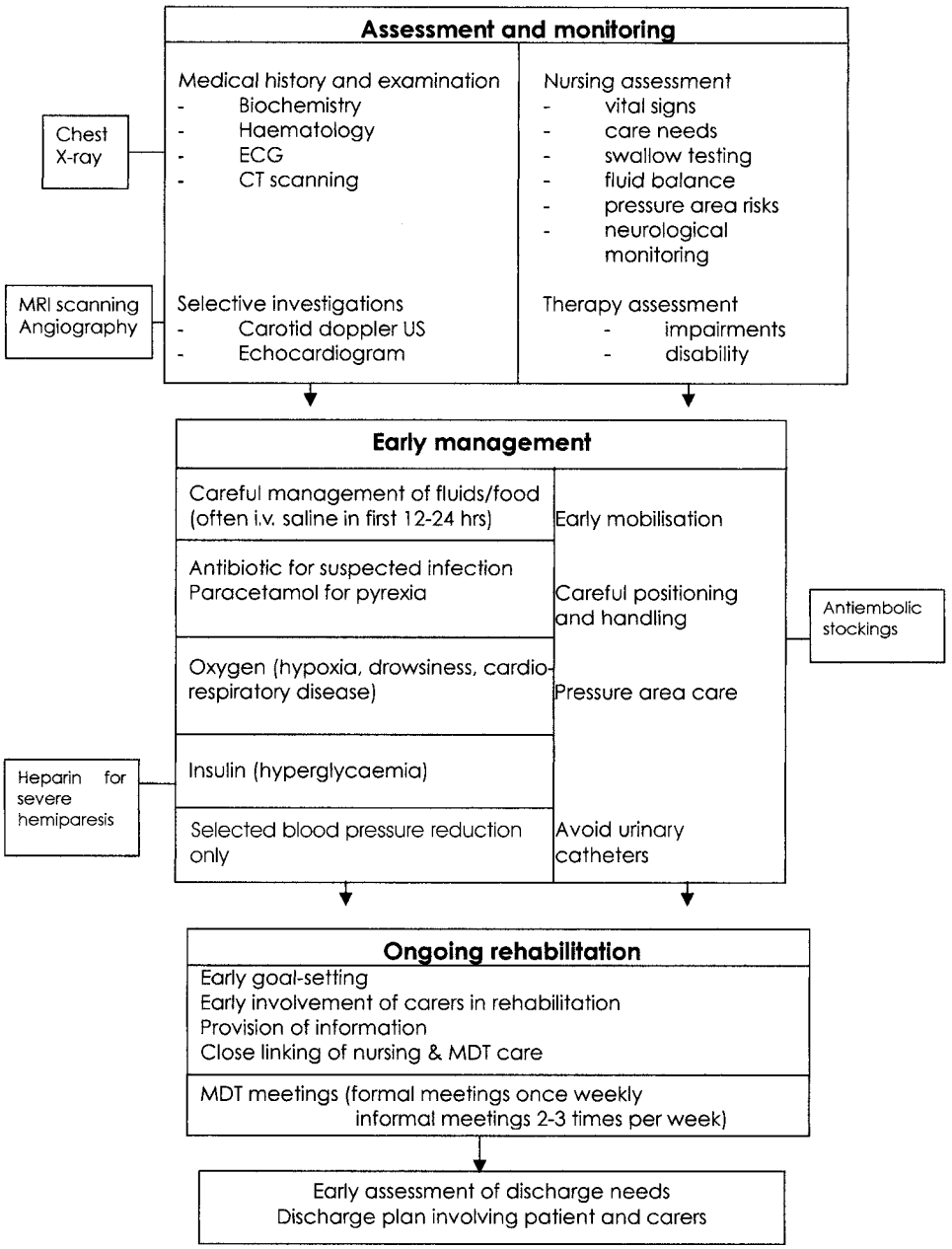

Figure 1. Outline of processes of stroke unit care. The figure outlines the main components of care reported in the stroke unit trials. Characteristics included in the central part of the figure were reported in the majority (> 50%) of trials. Those presented in peripheral boxes were reported in a minority of units only (< 50%).

common view that a degree of dehydration may be beneficial to reduce cerebral oedema [23]. The policy of avoiding urinary catheter use wherever possible contrasts with normal practice in many hospitals where catheterization is routinely used.

Despite the limitations outlined above we believe this is the most comprehensive survey of effective stroke unit care which should be used to guide clinical practice. We recognize that the information provided here is not as reliable as that from randomized trials directly evaluating individual interventions (e.g. aspirin or heparin use). However, many interventions in stroke patient care (e.g. early mobilization, continence care, moving and handling procedures) have not been subject to direct testing in reliable clinical trials. We believe the information in our survey should act as a benchmark for practice in these areas.

In summary, we have tried to describe the typical processes of care in the stroke unit trials. Until more reliable clinical evidence becomes available, these descriptions of care should serve as a benchmark for general stroke patient care and future clinical research.

Key points

- Stroke units improve outcomes after stroke but the process of care has been poorly understood.
- We describe a complex multidisciplinary process of assessment, early management and ongoing rehabilitation.
- This description should serve as a benchmark for patient care and future research.

Acknowledgements

Peter Langhorne and Alex Pollock designed the project, collected data and drafted the final report. The Stroke Unit Trialists' Collaborators provided original data, advice and comment, and assisted with the re-drafting of the final report. Peter Langhorne, Alex Pollock, Martin Dennis, Graeme Hankey and Brian Williams comprised the writing committee. This project was funded by Chest Heart and Stroke Scotland.

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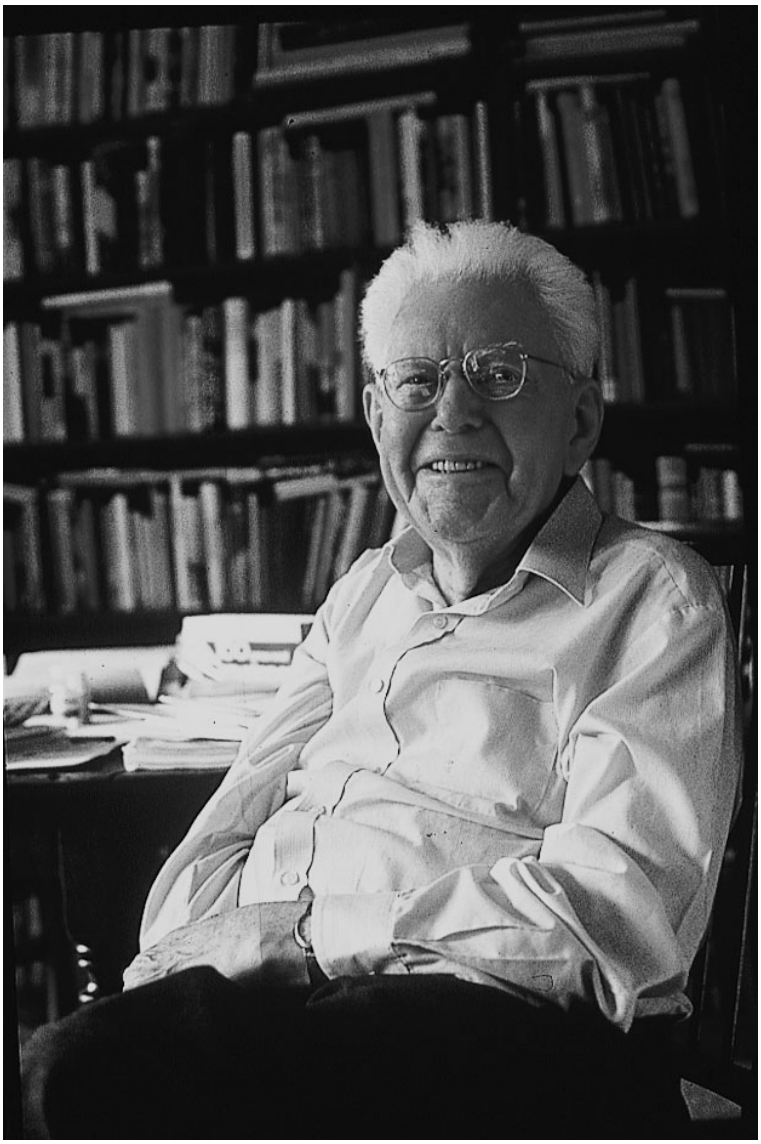
Received 8 October 2001; accepted in revised form 16 April 2002



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