

EVIDENCE BEHIND STROKE REHABILITATION

P Langhorne, L Legg

J Neurol Neurosurg Psychiatry 2003;74(Suppl IV):iv18-iv21

Stroke is a common and serious condition for which there is no routinely available curative treatment. Because of the high burden of disability and the lack of a widely applicable medical treatment, much of post-stroke care relies upon rehabilitation interventions. This article will discuss the evidence behind stroke rehabilitation interventions, but before doing so we need to define some terminology. Rehabilitation has a rather non-specific definition: "a problem solving process aiming at reducing the disability and handicap resulting from a disease". In this article we will use a broad definition of rehabilitation, which includes any general aspect of stroke care (generally non-surgical, non-pharmaceutical interventions) that aims to reduce disability and handicap (that is, promote activity and participation). This definition avoids an artificial splitting of early (often termed "acute") and later ("rehabilitation") care; rehabilitation interventions are relevant from the onset of symptoms. The main focus will be on evidence about treatments as these are the most common questions posed by clinicians.

CHALLENGES TO EVIDENCE BASED PRACTICE IN STROKE REHABILITATION

Conducting methodologically rigorous evaluations of rehabilitation interventions is complex. Firstly, rehabilitation interventions are traditionally tailored by a therapist or nurse to meet the identified needs of an individual patient. As such they can be difficult to define and test within a randomised trial. Secondly, a key strength of the randomised trial can be that both patients and health professionals are blind to the treatment given. In a circumstance where a therapist is applying a manual treatment technique to a patient it is often impossible to achieve such double blinding, although blinding of outcome assessment is usually possible (single blinding). Thirdly, many rehabilitation interventions are targeted at ameliorating a specific body function or promoting a specific activity. It can often be difficult to find a clinically meaningful, reliable, valid measure of outcome that is sensitive to any changes occurring as a result of the intervention.

It could be argued that the particular strengths of randomised trials in rehabilitation lie, not with the detailed evaluation of very specific treatment decisions, but with the evaluation of more general rehabilitation policies (for example, policies for preventing shoulder pain or bed sores). As a result of these limitations, most randomised trials in stroke rehabilitation are conducted in a single centre and are frequently too small to provide a reliable answer in their own right. We therefore need to include all relevant trials in rigorous reviews (systematic reviews) of the evidence. Such reviews may also help counter concerns that individual rehabilitation trials have poor generalisability and are only relevant to their local area or specific circumstances.

DEFINING AND EVALUATING STROKE REHABILITATION INTERVENTIONS

One of the first challenges in creating a framework of evidence for stroke rehabilitation is to have a mechanism for describing and discussing rehabilitation interventions. One simple approach is to classify them according to their levels of complexity. For example:

- ▶ *Service level*—These are typically provided by more than one individual, each providing a complex package of care in a specific context and interacting with others in a complex way. Examples might include stroke unit interventions or early supported discharge services. Some of the most robust stroke rehabilitation evidence comes from trials of such complex interventions. However, there is often difficulty in interpreting and implementing such evidence.
- ▶ *Operator level*—These interventions are typically provided by a single operator such as the therapist or nurse, who provides a complex package of care that could incorporate both the personal interaction between the therapist and patient plus the therapy they provide. A good example of this level of intervention is occupational therapy for stroke patients living at home or stroke family support workers.
- ▶ *Treatment level*—At this level of complexity, the impact of a specific individual treatment is evaluated. Arguably this may provide the most useful evidence for a clinician. Ideally the potential impact of the therapist should be removed from the evaluation of an individual reproducible intervention, but in practice this can be difficult to achieve. Examples of such

See end of article for authors' affiliations

Correspondence to:
Peter Langhorne, Professor of
Stroke Care, Stroke Therapy
Evaluation Programme (STEP),
Academic Section of Geriatric
Medicine, Level 3, Centre
Block, Royal Infirmary,
Glasgow G4 0SF, UK;
pl11m@clinmed.gla.ac.uk

Table 1 Summary of some of the available evidence supporting stroke rehabilitation

Evidence available	Level of intervention		
	Service level	Operator level	Treatment level
Several trials available/ reasonably conclusive (reasonable statistical power to guide decision making)	Stroke rehabilitation units have better outcomes than general medical wards Early supported discharge services reduce disability and institutional care in selected patients Multifactorial interventions can prevent falls	Occupational therapy (OT) input is effective for patients not admitted to hospital Exercise interventions can prevent falls Therapy rehabilitation services provided within one year of stroke can prevent deterioration in stroke patients living at home falls	Task related training can re-educate impaired balance Postural biofeedback can re-educate impaired balance High specification foam mattresses can prevent pressure sores in high risk patients Air fluidised and low air loss beds improve the healing of pressures sores
Several trials available/ inconclusive (inconsistent results or inadequate statistical power to confidently guide decision making)	Hospital at home (hospital avoidance) for acute stroke is less effective than stroke unit Day hospital or domiciliary input are of equivalent benefit Rehabilitation in a generic rehabilitation unit is better than a general ward Care pathways for stroke patients in hospital	OT input for stroke patients returning home from hospital Optimal methods of information provision after stroke The impact of routine input from a stroke family support worker The impact of speech and language therapy interventions for aphasia The impact of therapy rehabilitation services for stroke patients more than one year after stroke	Moving platform training to re-educate impaired balance Shoulder strapping for post-stroke shoulder pain Cognitive rehabilitation for spatial neglect after stroke Cognitive rehabilitation for attention deficits after stroke Electrical stimulation for post-stroke shoulder pain Constraint induced movement therapy after stroke
Little or no information from clinical trials (insufficient evidence or data of inadequate quality)	Stroke rehabilitation in community hospitals Rehabilitation in nursing homes "Nurse led" rehabilitation wards	Early mobilisation in acute stroke Pre-discharge OT home visits Speech and language therapy interventions for dysarthria Walking facilitated by therapist to re-educate impaired balance	Neurophysiological physiotherapy approaches to re-educate impaired balance Provision of walking aids to re-educate impaired balance Provision of lower limb orthoses for impaired balance Triamcinolone acetonide for post-stroke shoulder pain Cryotherapy for post-stroke shoulder pain Education of staff and carers on handling the hemiplegic arm Foam supports for preventing or relieving post-stroke shoulder pain Subscapularis motor point block for post-stroke shoulder pain Cognitive rehabilitation for memory deficits after stroke Piracetam as an adjunct for aphasia therapy after stroke Physical methods to prevent deep vein thrombosis and pulmonary embolism after stroke Different physiotherapy treatment approaches for recovery of lower limb function and postural control after stroke

treatment decisions include functional electrical stimulation for upper limb recovery and treadmill gait retraining.

This classification is used in table 1 to summarise some key areas of evidence. The main aspects of this summary are discussed below.

EVIDENCE FOR STROKE REHABILITATION

Service level interventions

Multidisciplinary stroke units

Several randomised trials have indicated that a package of rehabilitation in an organised multidisciplinary stroke unit service results in a reduction in deaths, disability, and the need for long term institutional care when compared with either conventional hospital care in general wards or home based rehabilitation teams (aiming to prevent admission to hospital). Most of the available evidence concerns either comprehensive stroke units (which admit patients acutely and can also provide a period of rehabilitation), or rehabilitation stroke units, which admit patients after the acute phase is complete. There is less complete evidence to support mixed rehabilitation units (providing stroke rehabilitation within a mixed rehabilitation setting).

There is less robust evidence to guide the more detailed planning of care within a stroke rehabilitation unit, although detailed descriptions of the clinical trials can be useful (table 2).

Stroke rehabilitation units have been established in a range of departments including geriatric medicine, general medicine, neurology, and rehabilitation medicine. In general these units had more similarities than differences. The key component of a stroke unit seems to be the presence of a coordinated multidisciplinary team (comprising medical, nursing, physiotherapy, occupational therapy, speech therapy, and social work staff). However, describing staffing levels is very difficult because of different ways of assessing staffing levels and cross-cover from other departments.

Patient selection criteria

Rehabilitation in a stroke unit appeared to benefit a wide range of patients, extending at least from those who have initially mild disability (for example, walking with assistance) through to those with severe symptoms (for example, no sitting balance) post-stroke. There do not appear to be any grounds for excluding patients on the basis of age, although

Table 2 Key characteristics of stroke rehabilitation units tested in randomised trials

Features	Key characteristics
Base department	Geriatric medicine, general medicine, neurology or rehabilitation medicine
Size	12–15 beds
Staff: multidisciplinary team (core members)	Medical, nursing, physiotherapy, occupational therapy, speech and language therapy, social work
Staff: skills	Knowledge, training and enthusiasm for stroke rehabilitation
Communication: between staff	Formal multidisciplinary team meeting once per week: identify problems, set recovery goals, and monitor progress
Communication: with patients and carers	Early active involvement of carers in the rehabilitation process. Routine provision of information on stroke disease, stroke management, secondary prevention, and support services

in many areas age related geriatric rehabilitation services may offer alternative services.

Multidisciplinary team communication

All stroke units in the systematic review had formal multidisciplinary team meetings at least once per week, which lasted one or two hours. These meetings served to introduce the patients to the multidisciplinary team and provide a forum for multidisciplinary assessment, problem identification, setting of short and long term rehabilitation goals, and decision making. In addition most units also held less formal meetings usually attended by nursing and therapy staff at which patients and carers would often be present. The multidisciplinary team usually had a programme of ongoing education and training.

Communication with patients and carers

A distinctive feature of stroke units in the systematic review was the early active involvement of carers in the rehabilitation process. Patients and carers were routinely provided with information on stroke disease, stroke management, secondary prevention, and support services.

Care pathways

It is possible to draw some general conclusions about the normal rehabilitation care pathways operating within the stroke unit trials

Assessment

The nursing assessment included the general care needs of the patient (with formal scoring of pressure sore risk) and an assessment of swallowing problems. The initial assessment by therapy staff includes an evaluation of impairments and disabilities.

Management

The stroke unit trials cannot guide practice regarding specific therapies, but a number of aspects of care were seen in the stroke unit trials—in particular, careful fluid balance (including the use of intravenous fluids), measures to prevent deep vein thrombosis, the early use of antibiotics for suspected infections, prevention of aspiration, and careful monitoring of key variables, such as nutritional status, continence, and skin integrity. Many units also describe a policy of early active mobilisation to prevent complications often associated with immobility. Avoidance of urinary catheters was also common. Therapy input generally begins early (within 24 hours of admission to the unit), although the total amount of therapy input was frequently no more than in conventional care settings. A variety of therapy approaches were described, and it was common to monitor recovery using an impairment or disability scale.

Discharge planning

A variety of approaches to discharge planning were described which indicated that early contact would be made with patients and carers and an assessment of needs at home undertaken. Many of the stroke unit trials also incorporated some method of post-discharge follow up.

Early supported discharge services

There is an expanding evidence base indicating that accelerating discharge home from hospital and providing a coordinated programme of rehabilitation in the home setting offers improvements over more prolonged rehabilitation in hospital. Patients randomised to an early supported discharge service were able to return home earlier and had improved longer term recovery in terms of reduced disability and a reduced need for long term institutional care. The available evidence indicates that these services should be provided by a skilled multidisciplinary team whose work is coordinated through regular meetings. Such services are probably only appropriate for a subgroup of stroke patients and best targeted at patients with mild to moderate stroke severity.

Day hospital services

The evidence is less conclusive on the question of the best setting for later community rehabilitation. It appears that when compared with no rehabilitation input, day hospital services may offer some benefit, but it is not clear if day hospital based services or domiciliary based services are the preferred option.

Operator level interventions

Therapy based rehabilitation for stroke patients living at home

A recent systematic review examined the impact of input from a physiotherapist, occupational therapist, or multidisciplinary team for stroke patients who are living at home (usually after discharge from hospital). This review indicated that this type of input could prevent longer term deterioration in activities of daily living although the absolute impact is relatively modest. There is no clear evidence to indicate the optimal intensity of such intervention.

Occupational therapy at home

Individual trials and a meta-analysis have explored the impact of a more specific package of occupational therapy input for individuals living at home and indicated that this also can reduce disability by improving both activities of daily living and extended activities of daily living.

Stroke family support workers

Several trials have evaluated the impact of a stroke family support worker visiting patients and carers at home. These interventions, which are often provided by nursing or social work staff, aimed to provide education, advice, and support. Currently there is insufficient evidence to draw firm conclusions although preliminary analyses indicated that carers may gain more benefit than patients.

Treatment level interventions

In general the evidence base for this level of rehabilitation intervention is less precise. Several examples, which are outlined in table 1, include task related training to re-educate impaired balance, postural biofeedback to re-educate impaired balance, high specification foam mattresses for the prevention of pressure sores in high risk patients, and air fluidised and low air loss beds for the treatment of pressure sores.

FUTURE DEVELOPMENTS

Much of the best evidence currently available to guide stroke rehabilitation practice concerns large complex packages of care, but even this is relatively limited. It is clear we require more randomised trials and systematic reviews of rehabilitation interventions, particularly focusing on specific rehabilitation treatments. We also need more basic scientific work to underpin the choice of treatments for testing.

However progress could be made in routine stroke care by simply applying what we already know. Some of the key elements of stroke rehabilitation evidence outlined above underpin national service initiatives such as the National Service Framework for older people (including stroke) and the NHS Quality Improvement Scotland developments in Scotland. The stroke therapy evaluation programme is aiming to facilitate access to relevant evidence on stroke rehabilitation by developing a website (effectivestrokecare.com) which

will provide up-to-date summaries of evidence rehabilitation choices.

ACKNOWLEDGEMENTS

The Stroke Therapy Evaluation Programme (STEP) has been supported by Chest Heart and Stroke Scotland and the Healthcare Trust

Authors' affiliations

P Langhorne, I Legg, Stroke Therapy Evaluation Programme (STEP), Section of Clinical Gerontology and Vascular Medicine, University of Glasgow, Glasgow, UK

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