Evidence-Based Community Stroke Rehabilitation

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Survival after stroke initially can depend on the acute phase of specialist hospital care; however, the greatest impact on patient health and well-being is from the long-term consequences faced when stroke survivors leave the hospital. Optimal recovery requires the provision of coordinated specialist rehabilitation, not only in the early stages of returning home but also, usually, many months after the stroke. Delivery of stroke specialist care in the patient’s home is increasingly common, particularly as health services face the challenge of reducing costs and are moving care out of expensive hospitals. There is also evidence that rehabilitation in the home environment is more beneficial for patients.1,2

Cumulative research evidence reporting the benefits of a variety of rehabilitative interventions addressing the longer-term consequences of stroke has been summarized in excellent reviews on stroke rehabilitation.3–6 Complementing these are national guidelines from countries such as the United States, Australia, Canada, and the United Kingdom that provide comprehensive guidance on a wide range of treatments that clinicians should consider in the rehabilitation of stroke patients.7–10 These documents also deal with the general organization of services, from managing discharge from hospital to specialist rehabilitation services operating in the community and longer-term care.

The purpose of this article is to combine information from research literature and guideline documents and to ask the question, what are the key issues when implementing evidence-based community services in practice? We focus on the need for specialist services for stroke patients once they leave the hospital and highlight tensions between the clinical desires to deliver tailored, complex interventions with the need for clear specifications for leaner services in a period of financial austerity. There is also evidence that rehabilitation in the home environment is more beneficial for patients.1,2

What Clinical Interventions Should Be Delivered?
The purpose of rehabilitation is to limit the impact of stroke-related brain damage on daily life by using a mixture of therapeutic and problem-solving approaches.3 Simplified as a process, stroke rehabilitation involves assessment, goal-setting, intervention, and reassessment.3 In reality, given the heterogeneous nature of the impact of stroke and varying trajectories of recovery periods of each functional limitation, the rehabilitation of stroke survivors is complex. Sometimes it is appropriate to target a specific impairment (eg, problems with dexterity) with a specific treatment (task-specific training). However, goals such as increasing social participation require strategies involving a range of treatments and the provision of a complex intervention with several interacting components.
From a research perspective, investigating the effectiveness of a specific treatment can be more straightforward than testing the effects of complex interventions in which any of a combination of components may be efficacious. Complex interventions also tend to display sensitivity to the local context, produce impact on a wide range of variable outcomes in the target population, and exhibit complexity in the causal chain linking the intervention with the outcome.14 There is a wealth of robust evidence (featured in systematic reviews of randomized controlled trials) supporting the use of specific treatments, such as constraint-induced movement therapy to address motor impairments.15 In keeping with our interest in the implementation of evidence-based health care, we focus on the delivery of complex interventions, often involving a combination of therapy approaches. These tend to be differentiated and examined in the research literature in relation to therapy disciplines; however, it is recognized that in rehabilitation, focus should be on the patient’s goal and not on who does what with the patient. Trials have investigated occupational therapy aimed at improving activities of daily living or leisure; physiotherapy interventions addressing gait, balance, and movement; and speech and language therapy aimed at improving language, communication, or swallowing. Other trials have evaluated the effectiveness of multidisciplinary services such as Early Supported Discharge (ESD) services, in which therapists provide a coordinated, mixed therapy intervention. There is also an increasing research interest in the provision of information and counseling support to stroke survivors and carers and the role of social care and voluntary sector organizations.

To provide evidence-based community services, providers and purchasers of services need to know which interventions are most effective and how to deliver these interventions in practice. The Cochrane Outpatient Service Trialists systematic review showed that therapy from a physiotherapist, occupational therapist, or multidisciplinary team for patients with stroke who live at home could prevent deterioration in activities of daily living (absolute reduction in risk of deterioration was 7 per 100 patients). The review concluded that it was not possible to identify if any delivery model was better than another.16 Here we examine the research evidence from this and other systematic reviews that support 4 different types of community stroke service.

**Multidisciplinary Stroke Teams**

Much of the evidence supporting the implementation of multidisciplinary stroke teams relates to ESD services. Trials have been conducted to investigate whether such services can accelerate the discharge from hospital to home and provide early rehabilitation at home at the intensity that would have been received in hospital. Results from meta-analyses featured in 2 reviews show that ESD services provided by coordinated, multidisciplinary teams of stroke specialists can significantly reduce length of stay at the hospital and increase the likelihood of regaining independence in daily activities for survivors of mild to moderate stroke.218 Of the 3 models of multidisciplinary service featured in the review, teams that planned and coordinated discharge from hospital to home and provided rehabilitation and support at home were the most effective.218 ESD services tend to operate in the first few months post-discharge, although whether it is beneficial to do so for a fixed period or for as long as the patient needs it remains unclear.18 The implementation of ESD services has been recommended in both United Kingdom and Australian stroke guidelines.510

**Single Discipline Therapy-Based Rehabilitation at Home**

Findings from a meta-analysis showed that occupational therapy services at home that were delivered within 1 year of stroke significantly improved both personal activities of daily living and extended activities of daily living (eg, self-care and basic mobility, domestic and leisure skills).19 The efficacy of several occupational therapy interventions was explored in another systematic review, and again occupational therapy was shown to result in significant improvements in activities of daily living (measured by the Barthel Index and Nottingham Extended ADL Scale) and social participation.20 With regard to physiotherapy, task-specific training for lower limbs was shown to result in functional gain (walking distance, walking speed, and sit-to-stand).21 and augmented exercise therapy (delivered by occupational therapists or physiotherapists) had a small but favorable effect on activities of daily living.22 In terms of service delivery, in countries such as the United Kingdom, therapists providing rehabilitative care in stroke patients’ homes often work out of a community-based stroke team,22 many of which now work with or incorporate ESD services. In Canada and the United States, this type of care is generally referred to as “home-based” rehabilitation.79

**Rehabilitation Delivered at a Day-Hospital or in Residential Care**

For patients who are able to travel, rehabilitation can be received from an outpatient clinic at a local hospital. This type of service tends to be referred to as “center-based therapy” in Australian and United States guidelines, particularly for United States patients not eligible from an insurance perspective for home-based services.24 A systematic review compared the effectiveness of this treatment with rehabilitation delivered at home. There was either no difference between groups in some trials or some reported benefits in favor of home-based rehabilitation. The overall conclusion from meta-analysis was that home-based rehabilitation is superior to center-based rehabilitation for functional benefits (as measured by the Barthel Index) in the first 6 months after stroke.1

The provision of specialist stroke rehabilitation also has been shown to be beneficial for patients in residential or nursing home care. Physical rehabilitation was shown to improve activities of daily living and independence,2526 and the fact that such results were achieved after a relatively brief intervention (≈3 visits or 4.5 hours treatment per month) highlights the importance of rehabilitation provision for this often-neglected patient population.

**Providing Information and Support to Patients and Carers**

Evidence suggests that provision of information (advice about stroke, prevention strategies, signposting to other services) improves patient and carer knowledge of stroke and aspects of patient satisfaction and may reduce patient...
depression. The way information is provided is important, with strategies that actively involve patients and carers and include planned follow-ups, which are more beneficial. A recent Cochrane systematic review explored the benefits of health care workers or volunteers (“stroke liaison workers”) providing education and social support (including counseling) and liaison with other services. Although when considering the patient population as a whole, there were no overall significant health benefits, and it was concluded that patients with mild to moderate disability may still benefit from the input of stroke liaison workers. Specific interventions for caregivers recently have been reviewed, broadly categorized as “support and information,” “teaching procedural knowledge” (manual practical activities), and “psychoeducational” (coping skills). There were insufficient data to refute the use of support and information or psychoeducational strategies, whereas teaching procedural knowledge-type interventions were shown to have beneficial effects on caregivers and were deemed promising.

How Should Community Rehabilitation Services Be Organized?

Although there is a body of evidence supporting the provision of stroke rehabilitation services in the community, it remains unclear how best to organize such services. Information about when interventions should be delivered after stroke and the optimal intervention length and intensity remain vague. This means that key decisions regarding commissioning services can be difficult, resulting in a huge variability in the provision of services in practice. The commissioning of services relies on demand—the more patients who need, can access, and can benefit from a service, the more likely the service will be commissioned or purchased. It is also easier to predict the cost and staffing required of services that have a clearly defined remit in terms of which patients can access them, how long they operate, and the type and intensity of intervention provided. These requirements are at odds with the currently available evidence, which remains vague about which type of services should be in operation and for how long. An increasingly pertinent question is how much input is required from high-level stroke specialists and what can be delivered by more generic or lower cost options?

Stroke Specialist Care

What is clear, based on evidence reporting the superior effectiveness of ESD and specialist therapy provision over general care, is that stroke specialist care should be provided for a period of time after discharge from hospital. Stroke specialist care is defined as that provided by health care professionals with necessary knowledge, skills, and experience of management of stroke, evidenced by a suitable qualification and training. In the United Kingdom, this has been formalized by a Stroke Specific Education Framework, which identifies competencies across a range of disciplines and levels that are required by health professionals involved in stroke care. What is less clear is when, and if, stroke specialist care should be withdrawn.

Time and Length of Intervention

Most national guidelines refer to the organization of services in terms of a care pathway after discharge from hospital. This results in sections on transfer of care from hospital to home and discussion of integrated community care usually describing services as outlined, such as ESD services and input from stroke specialist therapists. There is then a further section on living with stroke, which tackles longer-term management after the active recovery phase is complete. It remains unclear when such services or interventions should be offered to patients and for how long, highlighted by the statement that “no specific guidelines about intensity or duration of treatment are justified” in the United States stroke rehabilitation guidelines. The pragmatic design of clinical rehabilitation trials means that it is common for interventions to be performed over a 6- or 12-week period and for the collection of functional outcome measures to occur at 3, 6, or 12 months after stroke. As a consequence, effects of interventions tend to be reviewed within these timeframes. A systematic review reported that augmented exercise therapy in the first 6 months after stroke resulted in small improvements in activities of daily living. In addition, it has been shown that home-based rehabilitation is superior to center-based rehabilitation for functional benefits in the first 6 to 8 weeks and 3 to 6 months after discharge. In contrast, there is inconclusive evidence regarding whether specialist therapy-based rehabilitation is beneficial >1 year poststroke. Although the consequence of this is a slightly artificial portioning of the care pathway into 6 weeks after discharge (ESD), up to 6 months (stroke specialist therapist or multidisciplinary team providing rehabilitation at home), and 6 to 12 months (non-specialist support), this at least provides an evidence-based framework for a care pathway.

In reality, individual patients may experience hugely different recovery rates relating to the initial severity of their stroke and their response to the type, intensity, and length of rehabilitation treatment offered to them. Some services, such as ESD, have been shown to be only beneficial for survivors of mild to moderate stroke (initial Barthel Index of 10–20). This means that those who experienced a very mild or more severe stroke (<10 Barthel Index) require alternative service provision when they leave the hospital. There needs to be a range of evidence-based services available and there needs to be flexibility for patients to follow a tailored care pathway based on their needs.

Follow-up Reviews of Stroke Survivors

National stroke rehabilitation guideline documents recommend that patients should be offered a review of their health and social status and secondary prevention needs by primary care services, typically within 6 weeks, at 6 months, and then yearly after leaving hospital. If performed systematically for all stroke patients, this would facilitate a clear pathway to specialist rehabilitation services if further intervention is thought to be beneficial. In addition, patients should be able to make direct contact with specialist stroke services, between reviews, if they need to. This would build some flexibility into the system, ensuring that if the length...
of stroke specialist rehabilitation provided to some patients was not sufficient at the time they received it, they would be able to access further specialist rehabilitation at a later stage if required.

**Intensity of Therapy**

Several systematic reviews have investigated whether high-intensity therapy improves recovery. These reviews included trials investigating the effects of physical and occupational therapy or repetitive task training. Although information about optimal levels of therapy in practice is not provided, there is general agreement that increased intensive training is helpful. Cumulative meta-analysis indicated a positive (but small) change in activities of daily living when a minimum of 16 hours of additional exercise time was provided in augmented therapy. But how much therapy is enough in practice and how many staff, and at what skill level, are required to provide it?

It is a general recommendation across national stroke guidelines that patients should undergo as much therapy as appropriate to their needs and as much as they are willing and able to tolerate. To provide a quantifiable target, United Kingdom and Canadian stroke rehabilitation guidelines recommend that patients receive a minimum of 45 minutes or 1 hour daily, respectively, of each therapy that is required. Intensity defined in terms of time delivered can be a crude estimate of the effort and energy spent in performing exercises, and the Canadian approach to basing recommendations according to stroke severity seems sensible. What appears to be most important is that therapy is tailored to the individual, particularly to the upper limb, for which benefits of intense repetitive practice may only be limited to those with less severe upper extremity deficits. What has yet to be adequately addressed in the literature is what levels of skill mix and training of staff are required for patient interventions to be designed effectively and delivered at the necessary intensity.

**Performance Indicators**

One final issue to consider with regard to the organization of community services is measurement of performance. How do therapy services measure their impact on patient recovery and how do they know they are operating effectively? Logically, standardized outcome measures that have demonstrated positive effects of rehabilitation therapy in research trials (e.g., such as the Barthel Index) should be routinely used in practice. In addition, process measures to optimally monitor the content, intensity, and length of intervention delivered need to be agreed on. The variety of outcome measures used in clinical trials and the lack of sensitivity of some when monitoring recovery of individual patients make this challenging. To ensure that services use robust approaches to quantify their impact on patient recovery, an agreed set of community stroke service performance indicators needs to be determined.

**A Consensus for the Implementation of Community Stroke Services**

The gaps and shortcomings in the evidence base mean that many decisions about both rehabilitative treatments and service delivery in the community continue to rely on the experience and judgment of service providers and commissioners. Although an inductive approach to improvements through the sharing of best clinical practice is attractive, what is missing is the elucidation of the key principles underlying what is effective in such practice and descriptive evidence to justify actions. An ESD consensus document recently has been published that defines the core components of an evidence-based ESD service to guide the implementation of services. To address longer-term aspects of the community stroke care pathway, authors of the ESD consensus have combined research evidence, clinical guidelines, and practical experience, and have performed a consensus activity with trialists, service users, service providers, and service commissioners. This Community Stroke consensus document will inform and facilitate the implementation of evidence-based community stroke services and is being performed in collaboration with the National Health Service Stroke Improvement Programme in the United Kingdom.

**Conclusions**

Research evidence has shown that specialist rehabilitation of stroke patients in the community can lead to improved recovery, with regaining of independence and improved abilities to perform activities of daily living. To ensure that community stroke services are developed optimally, more research is required to evaluate the intensity and length of stroke-specific interventions delivered in practice. The challenge is to provide flexible and patient-tailored services while adhering to evidence-based service specifications that show value for money. For any of this to make a difference, research needs to consider the implications of delivering interventions in practice, for us to provide the best evidence-based care.

**Acknowledgments**

The authors thank Claire Edwards for her help in collating the literature.

**Disclosures**

None.

**References**

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Stroke, 2013;44:293-297; originally published online October 23, 2012;
doi: 10.1161/STROKEAHA.111.639914
Stroke is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
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Print ISSN: 0039-2499. Online ISSN: 1524-4628

The online version of this article, along with updated information and services, is located on the
World Wide Web at:
http://stroke.ahajournals.org/content/44/1/293

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