

Delivery, dose, outcomes and resource use of stroke therapy: the SSNAPIEST observational study

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Scientific summary

The SSNAPIEST observational study

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Scientific summary

Background

Stroke is the biggest cause of severe adult disability in the UK and globally. Treatment in a specialist stroke unit is the cornerstone of stroke care, as it reduces death and disability. A fundamental element of stroke care is assessment and treatment by specialist stroke therapists working within a multidisciplinary team. It is well established that stroke therapy (comprising physiotherapy, occupational therapy, speech and language therapy, and psychology) is effective, but that it needs to be provided intensively. There is clear evidence from observational studies that stroke therapy is rarely provided in sufficient amounts to maximise recovery. Our aim was to understand why this happened and the implications that this may have for service provision.

Objectives and research questions

The overall objective of this project was to investigate how inpatient and community-based stroke therapy is organised and delivered in England, Wales and Northern Ireland, and the associations this may have with patient-related and organisational factors, outcome and cost. The specific research questions were as follows.

Describing stroke therapy

- How much (inpatient and community-based) stroke therapy is provided?
- How many stroke services include community-based stroke therapy?
- What is their access to the wider multidisciplinary team?
- What are stroke therapy staffing levels and working hours?
- What is the quality of therapy-related processes of care?
- How much variation exists in the amount of each therapy received?

Identifying the different therapy pathways

- Which stroke therapy models/pathways are used?
- What are the characteristics of the patients who follow each pathway?
- What therapies do they receive?
- How much does each pathway cost?

Identifying stroke subgroups based on their stroke-related impairments

- What is the frequency of stroke-related impairments?
- Which impairments are commonly comorbid and to what extent?
- Do patients with common comorbidities receive different amounts of therapy or achieve different clinical outcomes?

Identifying the factors associated with therapy provision

- Which organisation- and patient-related factors are associated with the amount of therapy provided?

Exploring therapy and outcomes

- How is therapy provision associated with patient- and service-related outcomes?

Stroke resource use

- How is the amount of stroke therapy associated with resource use during inpatient stroke care?

Methods

Secondary analysis of the Sentinel Stroke National Audit Programme databases, which collect data regarding stroke care for all patients admitted in England, Wales and Northern Ireland. Data for all patients admitted with stroke between July 2013 and July 2015 who survived and were an inpatient for at least 72 hours were included. The acute and post-organisational audits in 2014 and 2016 were linked with the clinical data. Descriptive statistics, multilevel mixed-effects regression modelling with appropriate link functions and, specifically, negative binomial regression models (to assess resource use), were used to address the research questions. Costs were calculated using NHS and Personal Social Services Research Unit cost resource utilisation data, linked with Hospital Episode Statistics data. There are several ways to quantify the amount of therapy a patient receives. A simple ratio of minutes per day of therapy would produce the average therapy received per day on which they received treatment (i.e. the average duration of a treatment session). However, patients rarely received therapy every day and, in order to reduce the impact of reporting bias, 'average therapy per day of stay', whether as an inpatient or during community-based treatment, was identified as the primary measure of the amount of therapy. Further information regarding the distribution, structure and content of therapy sessions was not available, which prevented a detailed analysis of the days on which therapy was received. Members of the patient and public involvement panel of the University of Manchester's Stroke Research Centre contributed throughout the project and a clinical academic advisory group was also convened.

Results

The need for therapy and average amount of therapy per day of inpatient stay were associated with resource use, in that patients treated by teams that provided more therapy per day of stay tended to have a shorter length of stay and, therefore, less resource use. Variation in resource use, unexplained by patient- or organisation-related characteristics was high.

A complex relationship between the amount of therapy and outcomes was seen. Greater amounts of any type of therapy were associated with improvements in length of stay and mortality. More occupational therapy, speech therapy and psychology were also associated with less disability and decreased institutionalisation at discharge. However, subsequent exploratory analysis indicated that increasing the amount of physiotherapy was associated with diminishing returns, such that large amounts of physiotherapy were associated with greater disability and institutionalisation on discharge.

Nearly all patients who were assessed to need therapy received it. Approximately 90% of patients were reported to require physiotherapy and occupational therapy, and half of patients required speech and language. Only 5% of patients were reported to need psychology, which may indicate that health-care professionals tend to underestimate needs when services are not available.

Several patient demographic and stroke characteristics were associated with variation in the amount of therapy received: primarily, stroke severity, the impairments present and the patient's pre-morbid level of disability. Additional patient-related factors associated with the amount of therapy included sex, age and ethnicity.

Once all known confounders were accounted for, the modifiable organisational factors that influenced the average amount of inpatient therapy per day of stay were as follows:

- The day and time of admission: patients admitted towards the end of the working week and during normal working hours received less inpatient therapy per day of stay than those admitted at other times. Note, although the day and time a patient has a stroke is clearly unmodifiable, the services provided at different times can be modified.
- Type of stroke team – patients admitted to a routinely admitting team received less therapy than those in specialist rehabilitation units.
- Timely therapy assessments: patients who received therapy assessments within 72 hours of admission tended to receive more therapy than those who were not assessed during this hyperacute period.
- Therapy and nurse staffing levels: inpatient teams with higher therapy and nursing staffing levels tended to provide more therapy than teams with lower staffing levels.
- Presence of an extended (weekend) therapy service and an early supported discharge service was associated with provision of more inpatient therapy.

For community-based therapy:

- Patients admitted to the community-based stroke team towards the end of the week tended to receive less therapy. Waiting times for patients to receive community-based therapy did not influence the amount of therapy received per day once treatment had started.
- Patients treated by an early supported discharge team tended to receive more therapy per day of stay than those treated by a community rehabilitation team or integrated (early supported discharge and community rehabilitation) teams.
- The frequency of team co-ordination and planning meetings: teams who met two or more times per week tended to provide more therapy per day of stay than those who met once a week or less.

To understand the detail of the therapy patients received, the routes that patients took through inpatient and community-based stroke services were examined. Over 800 routes were identified. By aggregating groups of patients with similar routes, the characteristics of four common stroke pathways (direct discharge, community rehabilitation, inpatient transfer and 'other') were identified, characterised and costed. Furthermore, patients' stroke-related impairments were explored to identify stroke subgroups, which could be useful to stratify and personalise the therapy that patients should receive. Seven distinct stroke impairment categories were identified and characterised. These were an important factor associated with the amount of therapy received per day of stay, and with outcomes. This allowed differences in the nature of stroke impairments and treatment pathways to be controlled during modelling of resource use and clinical outcomes.

We found that the average amount of therapy per day of stay varied, but was generally well below levels recommended in national guidance (45 minutes of each relevant therapy each day). The average amount of therapy, for those who needed it, ranged from 2 minutes (psychology) to 14 minutes (physiotherapy) per day of stay. Therapy also occurred infrequently; patients received treatment on only 20–60% of the days that they required it.

Therapy staffing levels were highly varied and included some stroke teams with very low staffing levels. Less than half of stroke teams provided an extended (weekend) therapy service and only around two-thirds of inpatient stroke teams had access to a psychology service.

Conclusions

We found that the amount of stroke therapy per day of stay was varied, but generally was very low. The reported need for psychology was implausibly low and suggests that the need is under-reported when services are not accessible. Both patient-related and organisational factors were associated with the amount of therapy provided per day of stay, predominantly stroke severity, therapy and nurse staffing levels, and the presence of an extended therapy service. More of all therapies were associated with shorter length of stay and thus less resource use, and lower odds of mortality. More occupational therapy, speech therapy and psychology were also associated with improved disability, and less institutionalisation. Complex associations were observed for the amount of inpatient physiotherapy, which suggests that high doses of physiotherapy may be associated with greater disability and institutionalisation. Why this occurred is not clear. Further prospective work is urgently needed to investigate these findings.

Implications for practice

The large body of information describing stroke therapy, the pathways and the stroke impairment categories can be used to describe, define, benchmark and develop services. The Stroke Impairment Categories may prove useful to develop personalised treatment protocols in the future. The length of stay identified for each pathway can be used as a benchmark to estimate discharge date after admission. On average, length of stay is 9–10 days for an acute or combined stroke team, whether or not the patient is discharged to community rehabilitation. If the patient is transferred to another inpatient stroke team, length of stay was approximately 1 month if initially admitted to an acute team and 2 months if admitted to a combined team.

Given that higher (therapy and nurse) staffing levels and an extended (weekend) therapy service were associated with more therapy, and more therapy was associated with improved length of stay, resource use and mortality, clinical services should consider the feasibility of increasing staffing levels and extending their availability. They should also look critically at the equity of the therapy provided in terms of sex, ethnicity and socioeconomic status.

Clinical interpretation of the complex associations between the amount of therapy and the other outcomes needs to be treated with great caution. They do not indicate that therapists only need to provide 5–10 minutes of therapy per day of stay for maximum benefit, nor that providing > 35 minutes of physiotherapy per day of stay is harmful. They do suggest that the simple mantra, the more therapy, the better, is an oversimplification and large doses of therapy may not be beneficial for all patients.

Further work is needed to:

- investigate, using robust prospective research, the complex association between physiotherapy and clinical outcome
- understand the optimal amount of each therapy to provide for different patient groups
- validate and determine the usefulness of the proposed Stroke Impairment Categories as a stratification tool, and to explore their use to predict therapy need and optimal dose, recovery and outcome; this may enable more personalised treatment algorithms to be developed for individual patients
- investigate the most effective way of organising and resourcing stroke therapy and rehabilitation services, including configuration of services, staffing levels and working hours
- better understand and overcome possible inequities of access to stroke therapy provision and resource use
- better understand how community-based stroke therapy services are organised and the therapy delivered

- understand why there is often an interval between completing therapy and discharge from hospital, and whether services should aim to remove or overcome it
- investigate the long-term needs of people with mild stroke who are discharged from hospital very quickly
- understand the reasons behind the extremely long lengths of stay for a small number of stroke survivors and how this can be managed.

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