Evaluation of cognitive assessment in stroke rehabilitation

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Objective: To assess the effect of cognitive assessment on the functional outcome of stroke patients and quality of life for both patients and their carers.
Design: A multicentre, single-blind, randomized controlled trial.
Setting and participants: Two hundred and twenty-eight stroke patients were recruited from hospital wards in three UK centres.
Interventions: Patients were screened for cognitive impairment and randomly allocated to either routine care (116 patients) or routine care plus a detailed cognitive assessment (112 patients).
Main outcome measures: Outcome was assessed three and six months after recruitment by an independent assessor blind to the intervention on Extended ADL, Cognitive Failures Questionnaire, General Health Questionnaire-28 for patients and carers and Carer Strain Index.
Results: There was no significant difference between the two groups in patients' functional outcome, perceived cognitive ability, level of psychological distress or satisfaction with care. There was a trend for the assessment group to have lower levels of carer strain ($p = 0.06$).
Conclusions: The provision of information about cognitive assessment in stroke rehabilitation may decrease carer strain.

Introduction

Stroke is one of the most common causes of severe disability.[1] In addition to physical impairments, there are often cognitive impairments, which act as barriers to functional and social independence[2] as well as affecting both patients' and carers' quality of life.[3,4] Cognitive impairments after stroke include problems with memory, perception, language, reasoning and attention and may affect the patients' response to rehabilitation.[5,6]

There are two approaches to assessing cognitive impairment: screening tests and a more thorough investigation of specific deficits through detailed batteries. Although screening tests such as the Mini-Mental State Examination[7] are widely used, particularly with older people, they provide only a rough guide to the presence of cognitive decline.[5] The specific nature of impairment and its relation to everyday living activities

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is only obtained by completing a more detailed assessment with provision of individualized results.[5] In clinical practice, detailed neuropsychological assessments influence the design of cognitive rehabilitation programmes, provide a baseline from which to measure the effect of interventions[8,9] form a basis for advice to patients, relatives and rehabilitation staff about the impact of cognitive deficits on everyday function.

Clinical psychology services vary widely across the UK. A Stroke Association survey[10] revealed that compared with other services psychology services were perceived as the most inadequate. A psychologist's role within stroke services can include assessment and treatment of cognitive difficulties and mood as well as psychological support to both patients and their carers. National Clinical Guidelines for Stroke[11] emphasize the importance of offering an assessment and treatment service for cognitive impairment. While there is some evidence for providing treatment,[12–13] the research evidence for the efficacy of assessment is lacking.

The importance of providing individual personalized information and advice to patients and carers has been investigated in the context of nursing[14,15] and family support.[16–18] Evaluations of family support services have shown that patients and carers benefit from information and education about stroke[16–18]. However, there is little evaluation of information, advice and support of a more specific nature related to the cognitive sequelae of stroke.

The aim of the present study was to evaluate the contribution of one component of a psychology service to the multidisciplinary rehabilitation of stroke patients. The focus was solely on the provision of cognitive assessment, followed by detailed feedback of personalized results and recommendations to the patient, carer and rehabilitation staff. The aim was to determine whether information from cognitive assessments would result in an improved functional outcome for patients and improved quality of life for both patients and their carers.

Method

This study was a multicentre, single blind, randomized controlled trial. Patients were recruited between September 1997 and May 1999 from four hospitals in three centres: Queen's Medical Centre, Nottingham, Derbyshire Royal Infirmary and Derby City General Hospital, Derby and Mansfield Community Hospital, Mansfield. Ethical approval was received from the local ethics committee in each centre. Patients were recruited from all those admitted to hospital with stroke. Stroke was defined clinically, using World Health Organization guidelines.[19] Patients were included in the study providing that they could complete assessments for at least 30 minutes at a time, did not have visual or hearing impairments to the extent that they could not be assessed and were conscious on admission to hospital. Informed consent was obtained from either the patient, or in the case of patients with severe language impairment, their relatives.

All patients recruited to the study were assessed by an assistant psychologist within four weeks of admission to hospital. They completed a short screening battery of cognitive assessments consisting of Raven's Coloured Progressive Matrices,[20] the Mini-Mental State Examination (MMSE)[7] and the Sheffield Screening Test for Acquired Language Disorders.[21] Their prestroke ability was assessed on the Barthel Index[22] and current disability was also recorded on the Barthel. Patients were randomized into one of two groups using numbered, sealed, opaque envelopes prepared from random number tables and stratified according to centre (Nottingham, Derby or Mansfield).

The control group received no further intervention from the assistant psychologist and the results of the screening assessment were not made available to the patients or the rehabilitation staff involved in their care. All wards could refer patients to clinical psychology services if they were required.

The assessment group received a further detailed battery of cognitive assessments in order to assess specific cognitive functions, including general intelligence, memory, perception, language, apraxia, executive function and mood. The Shortened National Adult Reading Test[23]

was used as an assessment of premorbid intellectual abilities. Perceptual abilities were assessed using the Rey-Osterreith Complex Figure Test[24] as a measure of spatial perception and the Behavioural Inattention Test Star Cancellation[25] as a measure of visual inattention. Recognition memory for verbal and visual material was assessed using the Salford Objective Recognition Test.[26] Immediate and delayed verbal recall were assessed on the Adult Memory and Information Processing Battery Story Recall.[27] The Apraxia Test[28] was used to assess for apraxia on a range of everyday movements. Mood was assessed using the Wakefield Depression Inventory.[29] Language function was assessed on the Controlled Oral Word Association Test[30] and executive function on the Cognitive Estimation Test.[31]

Depending on the specific deficits identified by the detailed battery, other cognitive assessments were administered to clarify the nature of the deficit, such as the Adult Memory and Information Processing Battery,[27] Revised Wechsler Memory Scale,[32] Psycholinguistic Assessment of Language Processing Ability[33] and Stroke Driver's Screening Assessment.[34] Feedback of results was provided to the patient, and if the patient agreed, the carer and recommendations were made to help them to compensate for any specific deficits. A report was completed summarizing the cognitive assessment results and providing specific recommendations in order to guide professionals involved in their rehabilitation. This was made available to the patient's general practitioner, consultant and any other professionals working with the patient, e.g. nurses, physiotherapists, occupational therapists, speech and language therapists.

Patient and carer outcomes were completed three and six months after randomization by an independent assessor who was blind to the intervention group. In people with cognitive impairment, restoration of function is unlikely and therefore effective rehabilitation focuses on reducing the effect of impairment on functional activities. This is expected to have a positive effect on levels of handicap. Therefore, all outcome measures used in the study were selected to evaluate the effect of the intervention on disability and handicap. The Barthel Index[22] and the Extended Activities of Daily Living Scale[35] were used to measure functional ability. Handicap was measured using the London Handicap Scale.[36] The General Health Questionnaire-28 (GHQ-28),[37] which includes items on somatic symptoms, anxiety and insomnia, social dysfunction and depression, was used to measure psychological distress. Perceived cognitive ability was assessed using the Cognitive Failures Questionnaire,[38] which is a subjective measure of everyday mistakes, such as forgetting why you went from one room to another, that patients rate as occurring from 'never' to 'very often'. Satisfaction with care was assessed using a visual analogue scale, ranging from 'totally satisfied with care' to 'totally dissatisfied'. Carer outcomes included the GHQ-28[37] as a measure of psychological distress and the Caregiver Strain Index[39] as a measure of strain.

Statistical analysis was performed using SPSS version 9. The area under the curve[40] was calculated and compared between assessment and control groups using a Mann–Whitney *U*-Test.

Results

There were 228 stroke patients recruited to the study, including 84 patients recruited from Derby, 32 from Mansfield and 112 from Nottingham. A further description of the sample is provided in Figure 1. The mean age of recruited patients was 71 years (SD 12.2) with 107 women and 121 men and 41 patients reported having had a previous stroke. Patients had an average of 10 years education (mean age left school: 15 years, SD 1.63).

There were no significant differences between the control and assessment group on demographic variables such as age, gender or level of education. Results are shown in Table 1. There were no significant differences on baseline measures of prestroke Barthel scores, Barthel scores at recruitment, MMSE or Sheffield Screening Test. However, Raven's Matrices scores were significantly higher in the assessment group ($p = 0.04$).

A summary measure of the area under the curve (AUC) was calculated for each outcome measure. This was compared between groups using a Mann–Whitney *U*-Test. Results are shown in Table 2.

There were no significant differences between the control and assessment group on measures of functional ability (Barthel, Extended ADL), perceived disability (London Handicap Scale), psychological distress (GHQ-28), perceived cognitive ability (CFQ) or satisfaction with care. There were no significant differences between groups on carers' levels of psychological distress (GHQ-28) or strain (Carer Strain Index). However there was a trend for levels of strain to be lower in carers of patients in the assessment group ($p = 0.06$). Analysis of covariance showed that a nonsignificant trend towards reduced strain in the assessment group remained when the effects of RCPM were accounted for ($F = 3.78$, $p = 0.06$).

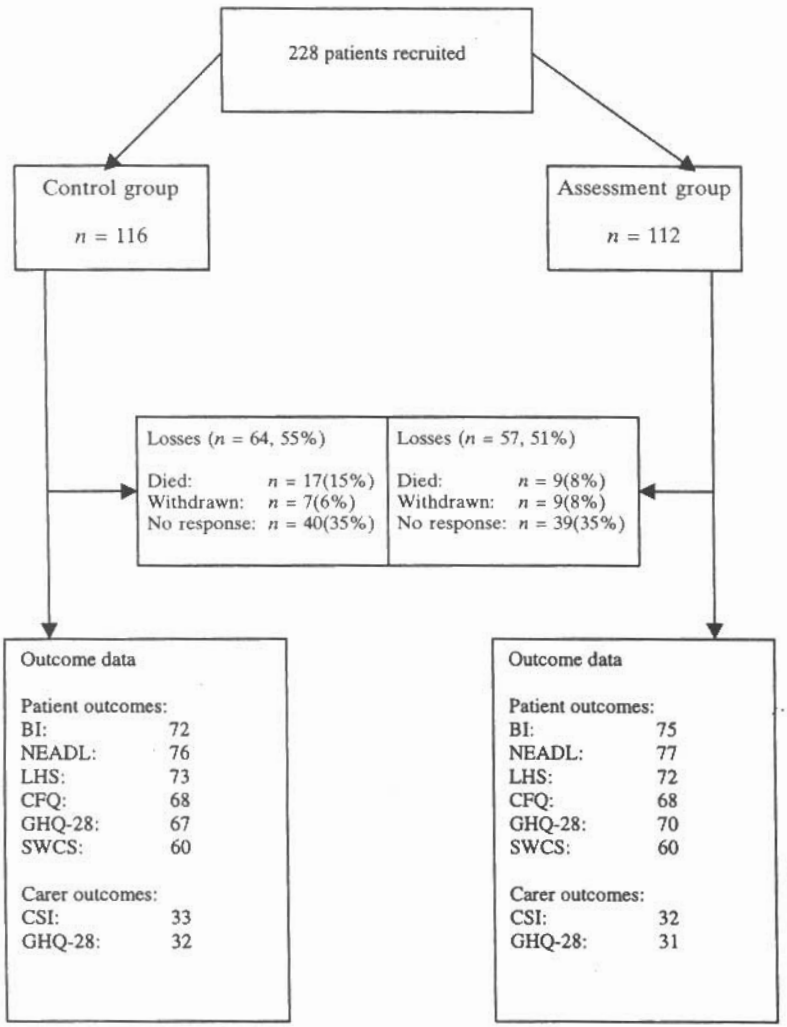

Figure 1 Randomization of patients. BI, Barthel Index; NEADL, Nottingham Extended Activities of Daily Living Scale; LHS, London Handicap Scale; CFQ, Cognitive Failures Questionnaire; GHQ-28, General Health Questionnaire-28; SWCS, Satisfaction with Care Scale; CSI, Carer Strain Index.

Table 1 Comparison on groups of biographical characteristics and baseline measures

	Control group (*n*)	Assessment group (*n*)	Comparison[a] *p*-value
Gender M:F	64:48	57:59	0.14
Carer			
None	31	35	0.39
Present	81	81	
Side of weakness			
Left	50	56	0.29
Right	56	52	
Bilateral/None	6	8	
	Median	Median	*p*-value
Age	72	72	0.91
Prestroke Barthel	20	20	0.33
Recruitment Barthel	9	10	0.32
MMSE	22	24	0.06
SST	15	16	0.24
RCPM	16	20	0.04*

*Significant at $p < 0.05$.
MMSE, Mini Mental State Examination; SST, Sheffield Screening Test for Acquired Language Disorders; RCPM, Raven's Coloured Progressive Matrices; [a]Chi-squared for categorical data and Mann–Whitney *U*-test for ordinal data.

Discussion

Providing information to the patient, carer and rehabilitation team about individuals' cognitive abilities following stroke had no significant effect on patients. However, there was a nonsignificant trend for carers of patients randomized to the assessment group to experience decreased levels of strain compared to those in the control group.

Proulx[41] suggested that families need information about how to compensate for patients' cognitive impairments so that they can help modify habits and roles to deal more appropriately with their everyday impact. Although we have no measure of how the cognitive assessment information was used by carers in the intervention group, understanding the nature of the patient's problems may have given them less cause for concern. The results of our study may be due to the provision of personalized care and support rather than specifically a result of cognitive assessment. Studies have indicated that individual packages of support to stroke patients and their carers, whether in the form of information packs,[42] personalized booklets[43] or support workers[16–18] can increase levels of knowledge and satisfaction and reduce carer strain. The present results are consistent with the effects of these more general supportive services.

The method of analysis used was a summary measures analysis. Matthews *et al.*[40] argue that traditional statistical analysis is not applicable to serial measurements collected as part of medical research and instead endorse the analysis of summary measures. However, the use of this technique requires full data sets and in the present sample, full outcome data were not available, due to death, further illness or cognitive impairment. However, the drop-out rates were equivalent in the two groups and so this is unlikely to account for the lack of differences found. The sample size

Clinical messages

- The provision of a cognitive assessment may reduce strain in carers.
- There was no indication that assessing cognitive impairments improved the functional outcome of patients.

Table 2 Comparison of groups on outcome measures

	Control group						Assessment group						Diff in AUC Median	AUC *p*-value
	n	Median			IQR	95% CI Median AUC	*n*	Median			IQR	95% CI Median AUC		
		3 m	6 m	AUC				3 m	6 m	AUC				
Patient														
BI	72	16	15	84.8	58–108	69–99	75	17	17	91.5	68–107	81–99	9.7	0.37
NEADL	76	8	8	22.5	9–40	9–17	77	7	8	22.5	8–43	14–29	0	0.87
LHS	73	60	62	184.5	156–215	172–197	72	64	61	188.7	152–223	173–204	4.2	0.44
CFQ	68	22	25	69.8	45–102	68–83	68	18	19	60	40–89	56–68	9.8	0.12
GHQ-28	67	5	2	15	8–29	11–23	70	4	2	12	5–25	9–17	3	0.18
SWCS	60	84	88	243	179–278	228–260	60	88	85	244.5	206–281	236–266	1.5	0.51
Carer														
CSI	33	6	6	18	12–25	12–21	32	5	4	15	6–21	8–20	3	0.06
GHQ-28	32	5	6	15	3–33	9–32	31	3	3	10.5	5–24	5–21	4.5	0.28

BI, Barthel Index; NEADL, Nottingham Extended Activities of Daily Living Scale; LHS, London Handicap Score; CFQ, Cognitive Failures Questionnaire; GHQ-28, General Health Questionnaire 28 Item; CSI, Caregiver Strain Index; IQR, Interquartile range; CI, Confidence Interval; diff, Difference in medians; AUC, area under the curve.

was comparable to other studies but the nature of deficits was very heterogeneous and the inclusion of three centres to make the findings more generalizable and to increase the sample size may have increased the heterogeneity, reducing the power of the study.

There was a baseline difference between the groups on the Raven's Matrices with assessment group patients scoring higher. This is most likely due to chance but could have led to the reduction in carer strain in this group. However, analysis of covariance, removing the effects of the Raven's Matrices, showed that this difference in carer strain remained, when the baseline difference in Raven's Matrices score was corrected for. It is therefore unlikely that the baseline differences had a significant effect on the results.

The results suggest that cognitive assessment may contribute to reducing carer strain through the provision of information. It would be worth examining whether the same effects could be achieved by providing an educational programme to rehabilitation staff about cognitive deficits, their relation to everyday function and techniques to compensate for them. This would enable scarce clinical psychology resources to be directed at other aspects of their role. Further studies should also be directed to the type of information that is most helpful to patients and carers and how this information may best be provided. Most of the wards on which the study took place had no psychology service prior to the study and there had been little detailed consideration of cognitive problems. It is possible that the timescale involved was insufficient for ward staff to encounter sufficient patients with each type of cognitive problem such that they could make use of the information provided. There may also have been a detrimental effect of considering one aspect of the psychologist's role in isolation. In clinical practice the assessment of cognitive deficits would have been carried out in conjunction with a treatment programme for deficits identified and in dealing with emotional and adjustment problems in both patients and carers. This artificial delineation of the service could have reduced the effectiveness of the service as a whole. However, an increase in the heterogeneity of the interventions provided would have required a larger sample.

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