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Clin Rehabil 2006 20: 577

DOI: 10.1191/0269215506cr978oa

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Long-term effects of the intensification of the transition between inpatient neurological rehabilitation and home care of stroke patients

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Received 28th July 2005; returned for revisions 20th September 2005; revised manuscript accepted 5th November 2005.

Objective: To investigate an intensified transition concept between neurological inpatient rehabilitation and home care for long-term effects on the care situation two and a half years after stroke patients' discharge.

Design: Controlled clinical trial allocating patients to intervention group (intensified transition on ward II) or control group (standard transition on ward I); patients were allocated to whichever ward had a vacancy. The last follow-up assessment was carried out on average 31 months after discharge.

Intervention: The intensified transition concept consisted of therapeutic weekend care, bedside teaching and structured information for relatives during the second phase of the rehabilitation.

Subjects: Seventy-one patients and their family carers were included, of which one case dropped out. Therefore 70 family carers – 35 individuals in each group – were available for assessment at long-term follow-up.

Data collection: Family carers were asked via telephone whether the patient was still alive and if so, where he or she is living – at home or in a nursing home.

Statistical methods: Binary logistic regression analysis with the care situation (home care versus institutionalized care or deceased) as dependent variable.

Results: Two and a half years after discharge (T3) in the intervention group significantly fewer patients were institutionalized (2 versus 5) or deceased (4 versus 11) ($P=0.010$). Multivariate analysis showed that besides a higher functional life quality at discharge and lower patient's age, the participation in the intensified transition programme is the third significant predictor for home care at T3.

Conclusion: Effects of an intensified transition programme can persist over a long-term period. They can sustain home care by reducing institutionalization and mortality.

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10.1191/0269215506cr978oa

Introduction

To organize rehabilitation programmes it is useful to know the long-term outcome of stroke rehabilitation.^{1–3} The long-term results presented here refer to the results of a controlled clinical trial.⁴ In this clinical study the effects of an intensified transition programme between neurological inpatient rehabilitation and home care of stroke patients were analysed on the basis of a six-month observation period. In the control group a standard transition programme was used. Even though there are few differences of moderate intensity between the two groups, the intensified transition programme does not affect either the functional status of the stroke patients or aspects of the health of the carers in the first six months after discharge.

The follow-up trial described here has as its aim an investigation of the question of whether any long-term effects of an intensified transition programme on the care situation can be identified two and a half years after discharge from the rehabilitation clinic.

Methods

The presented long-term evaluation is a follow-up to a previously published clinical trial.⁴ The methods were described there in great detail. Therefore, only the most important facts will be given here in summary.

Intensified transition programme at the rehabilitation clinic

The intensified transition concept included the standard transition programme (e.g. allowing family carers to watch therapy) and additionally (a) therapeutic weekend care at home before discharge monitored by an outpatient care service, (b) individual training course for family carers, (c) psycho-educational seminar for family carers and (d) telephone counselling three months after discharge.

Design

The study was established as a controlled clinical trial with an intervention group and a control

group. Only patients who had suffered a haemorrhagic or ischaemic stroke causing a substantial functional deficit were included in the study. At the time of registration in the clinic, the patients were distributed on two study wards (standard transition on ward I, intensified transition on ward II). They were allocated to whichever ward had a vacancy. Although this was not an explicit random allocation of patients to the study wards and consequently to the different transition programmes, patients' characteristics had no influence on the allocation procedure. At discharge 71 patients and their family carers who agreed informed consent were finally included in the study ($n = 36$ in the intervention group with the intensified transition and $n = 35$ in the control group with the standard transition).

Three years after the final inclusion of the first patient in the study family carers were interviewed via telephone (April 2005). This was on average two years and seven months after patient's discharge (mean $\pm$ SD: 31.1 ± 2.8 months, minimum 27 months, maximum 36 months). They were asked whether the patient is still alive and if so, where he or she is living – at home or in a nursing home.

The investigation was authorized by the Ethics Commission of the Faculty of Medicine of the University of Erlangen-Nuremberg (application no. 2547).

Subjects

Seventy-one stroke patients fulfilled the final inclusion criteria (36 in the intervention group, 35 in the control group). Because one family could not be traced, 70 family carers could be interviewed on average 31 months after patients' discharge.

At the time of discharge there was no significant difference between intervention group and control group for baseline data (Table 1).

Statistical methods and analysis

All statistical analyses were computed using the Statistical Package for Social Sciences (SPSS version 12.0 for Windows). Group differences were analysed using the *t*-test or the chi-square test.

Table 1 Baseline data at patients' discharge (T0) (intervention (I) versus control (C) group)

Parameter	I-Group (n = 36) Baseline (T0) ^a	C-Group (n = 35) Baseline (T0) ^a	Between groups P (two-tailed)
Patients' age	71.3 ± 8.8	73.2 ± 10.0	0.408 ^b
Patients' female	15 (42%)	10 (29%)	0.248 ^c
Barthel Index	66.1 ± 13.8	62.0 ± 21.2	0.339 ^b
FIM	90.2 ± 13.7	84.9 ± 21.2	0.214 ^b
Frenchay Arm Test	2.9 ± 2.3	3.3 ± 2.2	0.493 ^b
Ashworth Spasticity Scale	1.5 ± 1.2	1.2 ± 1.2	0.364 ^b
SF-36 _p	31.4 ± 6.0	30.3 ± 8.0	0.530 ^b
SF-36 _e	48.2 ± 12.1	49.1 ± 11.5	0.750 ^b
Timed Up and Go Test (possible ^d)	29 (81%)	27 (77%)	0.725 ^c
Pareses (upper extremity)	26 (72%)	23 (66%)	0.553 ^c
Pareses (lower extremity)	29 (81%)	27 (77%)	0.725 ^c
Gait disturbance			
None	4 (11%)	6 (17%)	0.465 ^c
Minor ^e	31 (89%)	29 (83%)	
Major ^f	0 (0%)	0 (0%)	
Carers'			
Age	59.7 ± 10.0	59.0 ± 9.3	0.754 ^b
Female	27 (75%)	26 (74%)	0.945 ^c
Physical complaints ^g	33.8 ± 25.6	41.8 ± 29.9	0.242 ^b
Depression ^h	58.5 ± 31.5	71.2 ± 26.4	0.077 ^b
Relation to patient			
Partner	23 (64%)	23 (66%)	0.370 ^c
Child	9 (25%)	11 (31%)	
Other	4 (11%)	1 (3%)	

^aFigures are means ± SD.^bt-test.^cChi-square test.FIM, Functional Independence Measure.⁵Frenchay Arm Test⁶ for testing the functionality of the upper extremities.Ashworth Spasticity Scale as modified by Bohannon and Smith⁷ for testing the functionality of the lower extremities.SF-36_p physical sum score of the SF-36.⁸SF-36_e emotional sum score of the SF-36.⁸Timed Up and Go Test⁹ for the assessment of the patients' standardized mobility.^dNumber of patients capable of getting to feet alone.^eMinor disturbance in gait: falls seldom (maximum twice in the last four weeks) and without subsequent injury.^fMajor disturbance in gait: frequent falls (more than two falls in the last four weeks) or falls with subsequent injury.^gPercentile rank of the sum score of the Giessen Symptom List (GSL-24) of Braehler and Scheer.¹⁰^hPercentile rank of the sum score of the Depression-Scale (D-S) of von Zerssen and Koeller.¹¹

The level of significance was fixed at $P = 0.05$. P -values of between 0.05 and 0.10 are considered as representing trends.

For T3 (31 months after discharge) the outcome variable was dichotomized as 'home care versus institutionalized care or deceased'. Those variables at the baseline T0 (patient's discharge) which indicate a significant correlation with the outcome variable constitute predictor variables for the later home care situation. Since predictor variables can influence each other, a binary logistic regression analysis was carried out in order to determine

which predictor variables show a significant correlation with the care situation at T3 in a multivariate analysis. A binary logistic regression analysis describes the care situation in terms of a binary dependent variable (home care (0) versus institutionalized care or deceased (1)). Independent predictor variables are either interval-scaled or dichotomized. Included in the regression analysis were all those variables which indicated either a significant correlation or correlation tendency in relation to the later care situation. The stepwise forward selection method of analysis was used.

Results

At T3 (on average 31 months after discharge) significantly more patients in the intervention group were living at home and fewer patients were institutionalized or deceased ($P = 0.036$, Table 2). Two other variables showed a significant correlation with the care situation at T3. For older patients and for patients with a lower functional life quality at baseline (T0) the probability that these patients would be living in a nursing home or would be deceased 31 months after discharge was significantly increased (Table 3). The functional life quality was measured using the physical sum score of the Short Forum General Health Survey SF-36 – external assessment, one week rating period.

At discharge (T0) the functional status (Barthel, Functional Independence Measure (FIM)) of those patients who 31 months later had either been institutionalized or who were deceased, was lower than that of the other patients (Table 3). There was, however, no significant difference between these groups. No association existed between FIM score and functional life quality at discharge (Pearson $r = 0.05$; $P = 0.709$). The association between Barthel score and functional life quality was slight ($r = 0.25$; $P = 0.040$).

For carer-related data one trend is apparent. There is a statistical tendency ($P = 0.099$) for patients with family carers with a higher depression score at discharge to be institutionalized or deceased at T3 (Table 3).

When the association between all potential predictor variables and the care situation at T3 is subjected to multivariate analysis using a binary logistic regression analysis, the following picture emerges: the study group remains statistically significant even in the final stage of the analysis ($P = 0.031$, Table 4). The strongest correlation with the long-term outcome was indicated by a diminished functional quality of life (physical sum score of the SF-36) at the baseline ($P = 0.007$) followed by an increased age ($P = 0.018$). No further statistically significant trend could be determined in the correlation between the carer's depression score at baseline and the later care situation (Table 4).

Discussion

The control study with a family carer interview on average 31 months after the patient's discharge investigated the long-term effects of intensified transition between inpatient neurological rehabilitation and home care. The allocation of the patients to the study groups was not guided in any way, but depended simply on beds in either ward becoming available as the patients were admitted. A 'truly' random allocation of the patients would have involved considerable financial expense, as beds would have had to be kept free on both wards for the entire recruiting period. There are two indications that the results are not a quirk of the non-randomization. First, the alloca-

Table 2 Outcome data 6 and 31 months after patients' discharge (intervention (I) versus control (C) group)

Outcome	I-Group (<i>n</i> = 36)	C-Group (<i>n</i> = 35)	Between groups <i>P</i> (two-tailed)
Six months after discharge			
At home	34 (94%)	31 (88%)	0.570 ^a
In a nursing home	1 (3%)	1 (3%)	
Deceased	1 (3%)	3 (9%)	
Lost ^b	1 (3%)	0 (0%)	1.000 ^c
31 months after discharge			
At home	29 (83%)	19 (54%)	0.036^a
In nursing home	2 (6%)	5 (14%)	
Deceased	4 (11%)	11 (31%)	

^aChi-square test.

^bCould not be traced 31 months after patients' discharge.

^cExact significance (Fisher test).

Table 3 Patients' and carers' characteristics at baseline (T0) in the two outcome groups

Parameter	Outcome group		
	Home care at T3 (n = 48) Baseline (T0) ^a	Institutional care or deceased at T3 (n = 22) Baseline (T0) ^a	Between groups P (two-tailed)
Patients' age	70.7 ± 9.8	75.5 ± 7.8	0.049^b
Patients' female	18 (38%)	6 (27%)	0.403 ^c
Barthel Index	66.0 ± 18.1	60.5 ± 17.3	0.228 ^b
FIM	89.8 ± 18.3	83.5 ± 16.3	0.170 ^b
Frenchay Arm Test	3.0 ± 2.3	3.3 ± 2.2	0.666 ^b
Ashworth Spasticity Scale	1.4 ± 1.4	1.2 ± 1.0	0.511 ^b
SF-36 _p	32.2 ± 7.1	27.9 ± 6.1	0.017^b
SF-36 _e	48.7 ± 12.4	49.4 ± 9.4	0.798 ^b
Timed Up And Go Test (possible ^d)	38 (79%)	17 (77%)	0.858 ^c
Pareses (upper extremity)	32 (67%)	17 (77%)	0.369 ^c
Pareses (lower extremity)	38 (79%)	17 (77%)	0.858 ^c
Gait disturbance			
None	6 (13%)	4 (18%)	0.528 ^c
Minor ^e	42 (87%)	18 (82%)	
Major ^f	0 (0%)	0 (0%)	
Carers'			
Age	58.8 ± 9.3	61.2 ± 10.1	0.334 ^b
Female	33 (69%)	19 (86%)	0.118 ^c
Physical complaints ^g	36.2 ± 27.5	43.2 ± 28.8	0.355 ^b
Depression ^h	62.0 ± 30.1	74.8 ± 24.0	0.099 ^b
Relation to patient			
Partner	32 (67%)	14 (64%)	0.190 ^c
Child	11 (23%)	8 (36%)	
Other	5 (10%)	0 (0%)	

T0, patients' discharge.

T3, 31 months after patients' discharge.

^aFigures are means ± SD.^bt-test.^cChi-square test.FIM, Functional Independence Measure.⁵Frenchay Arm Test⁶ for testing the functionality of the upper extremities.Ashworth Spasticity Scale as modified by Bohannon and Smith⁷ for testing the functionality of the lower extremities.SF-36_p physical sum score of the SF-36.⁸SF-36_e emotional sum score of the SF-36.⁸Timed Up And Go Test⁹ for the assessment of the patients' standardized mobility.^dNumber of patients capable of getting to feet alone.^eMinor disturbance in gait: falls seldom (maximum twice in the last four weeks) and without subsequent injury.^fMajor disturbance in gait: frequent falls (more than two falls in the last four weeks) or falls with subsequent injury.^gPercentile rank of the sum score of the Giessen Symptom List (GSL-24) of Braehler and Scheer.¹⁰^hPercentile rank of the sum score of the Depression-Scale (D-S) of von Zerssen and Koeller.¹¹

tion procedure was absolutely independent of patients' characteristics at admission. Second, patients' characteristics at discharge did not show any significant difference between intervention group and control group.

The limitations of the study are determined by the numbers of cases investigated ($n = 70$). Because only one family could not be traced, the results could not be influenced by drop-out effects.

The mortality rate among the total of 70 cases was 22%. As such this rate is within the range expected for stroke survivors in a period of approximately three years following the stroke incident.¹² In the Erlangen Stroke Project,¹³ which covers the same geographical area as here, the mortality rate among a representative sample of stroke survivors who survived for one month was 35% for the same period (PL Kolominsky-Rayas,

Table 4 Binary logistic regression analysis with the care situation at T3 (home care versus institutionalized care or deceased) as dependent variable

Step of analysis ^a	Variables in equation	Variables not in equation	Wald-statistic	P-value
1	Study group		6.23	0.013
		Functional life quality (SF 36 _p)	5.04	0.025
		Patient's age	3.18	0.075
		Carer's depression	1.88	0.171
2	Study group Functional life quality (SF-36 _p)		5.59	0.018
			4.69	0.030
		Patient's age	6.94	0.008
		Carer's depression	1.49	0.222
3	Study group Functional life quality (SF-36 _p) Patient's age	Carer's depression	4.64	0.031
			7.39	0.007
			5.57	0.018
			2.21	0.137

T3 patients' discharge.

^aMethod of stepwise forward selection.

SF-36_p physical sum score of the SF-36 which measures health-related quality of life.⁸

Characteristics of regression equation after the stage 3 of the analysis:

- The percentage of variance explained was 34% (Nagelkerke's *R*-square).
- 79% of the cases were correctly predicted.

personal communication). The rate is higher because patients were not selected for rehabilitation.

The rate of long-term institutionalization 31 months after discharge is 10%. This figure is also consistent with the results of Hermans *et al.*¹²

Since institutionalization and mortality are age-dependent and the average age of the control group was two years more, it is only possible to gain information about those variables which actually influence the outcome after an average of 31 months by carrying out a multivariate analysis of all potential predictors of the later care situation. The binary logistic regression analysis is the appropriate method to adequately analyse the

correlation with a binary dependent variable (home care versus institutionalized care or deceased).

The descriptive difference between intervention group and control group still remains significant using a multivariate control measure: in the intervention group with the intensified transition there were fewer patients living in a nursing home or deceased after an average of 31 months. What possible reasons could there be for this result?

Some indications can be observed in the few differences of moderate intensity between the two groups, identified in the previous study, which considered a period of six months following discharge⁴: in the first four weeks after discharge the patients in the intervention group had fewer new illnesses (in the majority of cases respiratory or systematic circulatory diseases). In the first six months after discharge the use of outpatient care services was more frequent in the intervention group; patients suffered less often from a fall with subsequent injury. Visits to the doctor did indeed take place sooner which could result in less severe disease-associated complications. Although when considered individually these effects partly lack statistical significance, there is a possibility that together they may have produced a long-term cumulative effect.

Clinical messages

- Methods of transition between inpatient neurological rehabilitation and home care of stroke patients should integrate the evaluation of the home care situation by outpatient care services before discharge.
- The long-term effect of such an intensified transition programme is the stabilization of home care by reducing institutionalization and mortality.

If patients and family carers are given an intensified transition programme, as used in the intervention group of this study, which includes more intensive psycho-educational training and gives the opportunity to learn practical skills, then the burden of predominantly somatic care can be better compensated for over a longer period of time. A stroke rehabilitation programme including carer information and training in care techniques, which were also part of our intensified transition concept, revealed no significant effect on patients' mortality and institutionalization 12 months after discharge.² The effect on mortality and institutionalization 31 months after discharge in the study presented was obviously encouraged by additionally applying therapeutic weekend care and the increased use of outpatient care services.

Age, as was to be expected, also has a significant effect. The probability that older stroke patients will be living in a nursing home or will have died 31 months after discharge is greater. There is, however, an even greater degree of association between functional life quality, as assessed by the physical sum score of the SF-36, and the later care situation. The greater the limitations on functional life quality at the time of discharge, the higher the rate of stroke patients who were later living in a nursing home or had died. On the other hand the functional status of the patient (Barthel, FIM) did not indicate a significant effect on the long-term outcome. It should therefore be investigated as to whether in future assessments of the outcome of rehabilitation measures the functional quality of life in addition to the functional status of the patient should also be considered as an indicator of success.

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