SHORT COMMUNICATION

EFFECTIVE REHABILITATION OF OLDER PEOPLE IN A DISTRICT REHABILITATION CENTRE

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Objective: **To assess the outcome of rehabilitation of older patients in a district rehabilitation centre.**
Design: **Prospective observational study.**
Patients: **A total of 202 patients aged ≥ 65 years rehabilitated at a Norwegian district inpatient rehabilitation centre, referred from district hospital, nursing homes or their own homes. Diagnoses were: stroke, arthrosis, hip fracture and other chronic diseases.**
Methods: **Admission: according to rehabilitation potential. Treatment: multidisciplinary team including an experienced general practitioner. Primary outcome measure: Sunnaas Activities of Daily Living (ADL) Index (SI). Secondary outcome measure: Umea Life Satisfaction Checklist (LSC). Cognitive (Mini-Mental State Examination (MMSE)), emotional (Symptom Check List-10) and marital status, residence, length of stay and hours/week private and home care services were recorded.**
Results: **SI increased significantly during the mean 3.1 weeks stay (mean 4.2, 95% confidence interval 3.5, 4.8), $p < 0.001$), persisting after 3 months. Eighty-four percent of patients scored satisfied according to LSC after rehabilitation. SI at discharge (adjusted for SI at admission) was predicted by MMSE and type of residence. Seventy-four percent of the patients needed home care services < 3 h/week, at discharge and 3 months later.**
Conclusion: **Significant and persisting improvements in activities of daily living may be achieved by rehabilitation of older patients with stroke, arthrosis, hip fracture and other chronic diseases in a district inpatient rehabilitation centre with co-ordinated and multi-disciplinary rehabilitation.**

Key words: aged; aged over 80; activities of daily living; rehabilitation; hospital; district.

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INTRODUCTION

The number and proportion of older people in the population will increase until 2030, in industrialized as well as in developing countries, contributing to a substantial growth in need for care (1). Shorter hospital stays mean that more older people are discharged with disabilities, imposing increased demands on district rehabilitation capacities (2). District rehabilitation services differ in terms of organization and location, and criteria for admission as well as the rehabilitation process are applied in various ways. A successful outcome requires rehabilitation potential, defined as the physiological and psychological possibilities of the patient to restore, keep or develop the best possible level of function and quality of life (2). Co-ordinated multi-disciplinary rehabilitation provides better functional gain and reduces the need for beds in nursing homes for geriatric patients (3), patients with stroke (4) and hip fracture (5). Unfortunately, however, there is insufficient evidence to assess the importance of rehabilitation environments, such as hospital, care home, and patient's own home, on the outcome of rehabilitation (6). Due to the increased demands on district rehabilitation capacities, we therefore urgently need more information about the optimal location and content of rehabilitation of older people in primary healthcare.

The main aim of the present study was to assess the outcome of rehabilitation of elderly patients in a district rehabilitation centre with a multi-disciplinary primary healthcare team offering structured rehabilitation. A further aim was to study life satisfaction, and how rehabilitation outcome and level of care after discharge were influenced by patient characteristics and by mental and emotional status.

MATERIAL AND METHODS

Setting and content of the rehabilitation process

Participants were patients who were admitted to the geographically detached district rehabilitation centre in Larvik, Norway, a mixed urban and rural community with 40,000 inhabitants. The centre has 16 beds and rehabilitates patients over 18 years of age, with physical and/or minor cognitive disabilities. Patients are referred from hospitals, nursing homes or their own homes and admitted if they are considered to have a rehabilitation potential. This decision is made by a team working at the centre, which includes an experienced general practitioner (GP), a nurse and an occupational or physical therapist. Rehabilitation potential means a certain level of activities of daily living (ADL), cognitive, emotional and physical function, as well as motivation. The centre defines rehabilitation as: time-limited, planned processes, with clear aims and means, where multi-disciplinary teams give assistance to the patient's own work to be as independent as possible, according to his

or her own wishes (2). The aims of the rehabilitation are defined on admission by the patient and the team together, and to return home is of highest priority. The aims are re-evaluated within a bio-psycho-social framework at weekly meetings of the multi-disciplinary team. There is close collaboration between the patient, the team, the patient's private network and the primary healthcare. Training is focused on physical function and ADL, individually or in groups. Home visits are made when the patient is capable, both as daytime visits and overnight stays. Discharge reports are sent to the patient's GP, and to the referring and other relevant wards.

Our main hypothesis was that elderly patients rehabilitated in the district rehabilitation centre would significantly improve their ADL-function from admission to discharge, and that the improvement would persist at 3 months' follow-up.

Patients

Patients were recruited from June 2006 to October 2007. Inclusion criteria were both genders, age ≥65 years, and diagnoses stroke, arthrosis, hip fracture and "others" (disability due to aging, long hospitalization or chronic diseases). A total of 363 patients were referred to the rehabilitation centre during the study period. Forty-seven patients were not admitted due to lack of rehabilitation potential. Of the 316 admitted patients 114 were not included due to age <65 years ($n = 33$), other than inclusion diagnoses ($n = 22$), 2 weeks planned group stays ($n = 40$), and absence of the project leader ($n = 19$). All the 202 eligible patients gave informed consent to participate in the study at entry. Ninety-one patients were admitted directly from home and 107 from the district general hospital (data missing for 4 patients).

Outcome measures

Outcome measures were chosen to cover the 6 categories of the International Classification of Functioning, Disability and Health (ICF) (7), as follows:

The *Sunnaas ADL Index (SI)* (8) measures 12 ADL and fits "activities" into the ICF. Each activity has a score from 0 to 3, where 0 = totally dependent, and 3 = independent. Scores <12 usually indicate a low rehabilitation potential. SI was the primary outcome measure and registered at admission, discharge and 3 months after discharge. The SI scores of the study patients were at a level where a 20% increase means a change from needing help to being independent in 2–4 ADL situations. Based on this, and on clinical experience, a 20% improvement in SI was judged to be clinically significant. The inter-item consistency between the more frequently used Functional Independence Measure (FIM) and SI is high for many items, but differences are also identified (9). We consider SI sufficient for describing the primary aim of the study. SI is simple and easy to interpret, which is important in primary healthcare.

The *Umea Life Satisfaction Checklist (LSC)* (10) is a simple and validated questionnaire, testing life satisfaction. We chose two of the questions: LSC-a: How satisfied are you with your life in general? LSC-b: How satisfied are you with your ability to manage your self-care? The scores are 1–3 = not satisfied and 4–6 = satisfied. LSC covers "participation" in ICF, and was both a secondary outcome measure and a possible predictor of outcome. It was registered at discharge and 3 months later.

The *Mini-Mental State Examination (MMSE)* (11) measures cognitive function and covers "body functions" and "structures" in the ICF. Scores are from 0 to 30. Values <22 indicate severe cognitive problems (12). MMSE was a possible predictor measure and was recorded 2 weeks after admission to exclude incidental confusion at entrance.

The *Symptom Check List-10 (SCL-10)* (13) is a questionnaire mapping emotional health during the last week, particularly anxiety and depression. SCL-10 comprises ten questions with scores from 1 to 4. The final score is the total score sum divided by ten. Scores >1.85 indicate severe emotional problems. SCL-10 covers "personal factors", "body functions" and "structures" in ICF. It was included as a possible predictor of outcome and recorded 2 weeks after admission to avoid possible emotional instability at entrance.

A score for home care services and informal care from relatives, which fits environmental factors in ICF, was recorded at discharge and 3 months later. The care scores were: 1: 0 h/week, 2: 1–2 h/week, 3: 3–5 h/week, 4: 6–8 h/week, and 5: ≥9 h/week.

Age, gender, type of residence, marital status, length of stay and diagnosis were also recorded.

Statistics

With a 20% increase in SI judged to be clinically significant, power calculation estimated a need for including 200 patients based on a beta of 0.80 and an alpha <0.05. Data were analysed in SPSS version 16.0 for Windows. Two groups of continuous, symmetrically distributed variables were compared by t-tests, and several groups by one-way ANOVA (*post hoc* test if $p < 0.05$). Asymmetrically continuous variables were compared by Mann-Whitney-Wilcoxon test. Correlations between continuous variables were analysed by Pearson's (symmetrical distribution) or Spearman's (asymmetrical distribution) correlation coefficient. Categorical variables were compared by Pearson's χ^2 test. Univariate regression analysis was used to explore predictors of outcome. Statistically significant predictors were analysed in multiple linear regression analysis.

Ethics

The study was approved by the Regional Ethics Committee for Medical Research and by the Norwegian Social Science Data Services.

RESULTS

Thirteen of the 202 patients died during the first 3 months after rehabilitation. Two patients were excluded due to serious medical complications.

Table I. *Patient characteristics, diagnoses, length of stay, cognitive and emotional status*

	Total	Men	Women
Number of patients, *n* (%)	202	59 (29)	143 (71)
Age, years, mean (SD)	80.7 (6.5)	78.8 (5.9)	81.4 (6.6)
[min–max]	[65–96]	[65–95]	[65–96]*
Residence, *n* (%)			
Own	168 (83)	50 (85)	118 (83)
Care-flat	34 (17)	9 (15)	25 (17)
Marital status, *n* (%)			
Married	71 (35)	35 (59)	36 (25%)
Alone	131 (65)	24 (41%)	107 (75%)**
Diagnoses, *n* (%)[a]			
Stroke	34 (17)	19 (33)	15 (11)***
Arthrosis	23 (11)	4 (7)	19 (13)
Fracture	82 (41)	17 (29)	65 (46)***
Other	61 (30)	18 (31)	(30)
Stay, weeks, mean (SD)	3.1 (1.6)	3.8 (2.4)	2.9 (1.1)****
[CI][b]	[2.9–3.3]		
MMSE, mean (SD)	25.0 (4.0)	24.3 (4.6)	25.2 (3.7)
[CI][a]	[24.4–25.5]		
SCL-10, mean (SD)	1.4 (0.3)	1.3 (0.3)	1.4 (0.4)
[CI][b]	[1.3–1.4]		

*$p = 0.007$ (independent samples t-test).
**$p < 0.001$ (Pearson's χ^2).
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****$p < 0.001$ (independent samples t-test).
[a]$n = 200$.
[b]$n = 201$.
MMSE: Mini-Mental State Examination; SCL-10: Symptom Check List-10; SD: standard deviation.

Table II. *Ability to perform activities of daily living (ADL) and Life satisfaction at admission, discharge and after 3 months in a community rehabilitation centre*

	Admission $n=201$	Discharge $n=201$	3 months after discharge $n=187$
SI, mean	23.3	27.5*	28.1*
(95% CI)	(22.3–24.4)	(26.8–28.3)	(27.2–28.9)
LSC-a, mean (95% CI)		4.4 (4.2–4.6)	4.3** (4.1–4.4)
Satisfied, n (%)[a]		168 (84)	147 (79)
LSC-b, mean (95% CI)		4.2 (4.0–4.3)	4.3 (4.1–4.4)
Satisfied, n (%)[a]		154 (77)	149 (80)

*$p<0.001$ (paired samples *t*-test) compared with at entrance.
**$p=0.03$ (95% CI of the difference (0.01,0.24)) (paired samples *t*-test) compared with at discharge.
[a]Score 4–6.
SI: Sunnaas ADL Index; LSC-a: Umea Life Satisfaction Checklist, satisfaction with life in general; LSC-b: Umea Life Satisfaction Checklist, satisfaction with ability to self-care 95% CI: confidence interval.

Baseline patient characteristics are shown in Table I. The women were older than the men, more frequently lived alone and stayed in the institution for a shorter period of time.

Changes in ADL function

SI improved significantly from admission to discharge, by 4.2 points, 95% CI (3.5,4.8), and the improvement persisted 3 months later (Table II). Improvement was shown in all 12 activities tested, with the largest increase in mobility-related activities. Patients with stroke and fracture improved their SI by 5.1 and 4.7 points, respectively, while patients with arthrosis and other diagnoses improved by 2.8 points. Length of stay was correspondingly longer for patients with stroke and fracture, at 4.0 and 3.3 weeks, respectively, compared with 2.8 and 2.5 weeks for patients with arthrosis and other diagnoses.

Life satisfaction

Eighty-four percent of the patients were satisfied with life in general (LSC-a), and 77% were satisfied with the ability to self-care (LSC-b) at discharge, vs 79% and 80% 3 months later (Table II). LSC-a did not correlate with improvement in SI, but LSC-b correlated positively. LSC-a and LSC-b did not correlate with cognitive status (MMSE), but were negatively correlated with emotional score (SCL-10).

Table III. *Multiple linear regression analysis, with ability to perform activities of daily living at discharge (measured by SI) as dependent variable*

Variable	Unstandardized coefficient B	p	95% CI for B
Constant	8.76		
Gender	−0.69	0.19	−1.72–0.34
Age	0.03	0.39	−0.04–0.11
Cognitive status (MMSE)	0.15	0.02	0.03–0.28
Residence (own- vs care-)	1.82	0.005	0.56–3.08
SI at entrance	0.52	<0.001	0.45–0.58

SI: Sunnaas ADL Index; 95% CI: 95% confidence interval; MMSE: Mini-Mental State Examination.

Level of care

At discharge, 74% of the patients received less than 3 h/week home care services, and 7% received more than 6 h. This remained stable during the 3-month observation period. At discharge the patients received significantly more home care services than informal care from relatives. At 3 months, there were no differences.

Predictors for SI at discharge

SI at discharge, adjusted for SI at admission, was independent of gender, age, life satisfaction, emotional and marital status, diagnoses and duration of stay, but was predicted by cognitive and residential status (Table III).

Predictors for level of care

Level of home care services at discharge was independent of gender, age, residential status, diagnosis and life satisfaction in general, but was predicted by satisfaction with ability to self-care, cognitive, emotional and marital status (Table IV).

The 15 patients who died or were excluded did not differ from the 187 remaining patients regarding improvement in SI, SI at baseline or LSC scores.

DISCUSSION

This Norwegian study demonstrates that significant and persisting gain in ADL may be achieved by rehabilitation of older patients with stroke, arthrosis, hip fracture and other chronic diseases in a primary healthcare rehabilitation centre with co-ordinated and multi-disciplinary rehabilitation.

LSC-a refers mainly to existential values. It is therefore reasonable to assume that the answers were not influenced by the improvement in ADL-function. The amount of home care services was equal to care from relatives at 3 months follow-up, indicating that they took their share of care for older people. The level of home care services, but not the level of SI, was associated with poorer emotional status, living alone and dissatisfaction with ability in self-care, indicating that need for home care services is not only a result of ADL-function, but is also influenced by "softer" values. The ICF (7) enables a bio-psycho-social description of the patients to be made, and

Table IV. *Multiple linear regression analysis, with public care at discharge as dependent variable*

Variable	Unstandardized coefficient B	p	95% CI for B
Constant	3.53		
Gender	0.15	0.28	−0.13 to 0.43
Age	0.01	0.59	−0.01 to 0.02
Marital status	0.47	0.001	0.20 to 0.73
SCL-10	0.40	0.05	0.002 to 0.81
MMSE	−0.06	<0.001	−0.09 to −0.03
LSC-b	−0.19	0.003	−0.33 to −0.07

95% CI: 95% confidence interval; SCL-10: Symptom Checklist-10; MMSE: Mini-Mental State Examination; LSC-b: Umea Life Satisfaction Checklist, satisfaction with ability to self-care.

through this model we could show the independency between improvement in ADL-function and life satisfaction in general and the "soft" predictors of level of home care services.

A limitation of this study was the design, as it was not possible to randomize the patients and there was no control group. A possible bias is that the first author worked at the rehabilitation centre during the study period.

We have not been able to identify other studies of the rehabilitation of elderly people that have been carried out in a primary healthcare setting like ours. The study rehabilitation centre, however, has similarities to intermediate care community hospitals in the UK, Finland, Norway, and the Netherlands (14–17). These are small hospitals (20–30 beds), anchored to primary healthcare, with few on-site diagnostic services, multi-disciplinary staffed and focusing on pre- and post-acute needs and on rehabilitation of older people. An important difference from our model is that community hospitals usually have geriatric consultants instead of, or in addition to, GPs. Loss of independence at 6 months after discharge was significantly less likely after rehabilitation of older people in community hospitals in the UK and Norway compared with prolonged general hospital care (18, 15). In our opinion the functional gain in these studies is consistent with the clinically significant and persistent improvement in SI in our study.

The costs of GP hospitals and intermediate care hospitals are lower than costs in general hospitals (19, 20), and may thus represent a cost-effective model for rehabilitation of older people. Defining the optimal setting and content of rehabilitation in primary healthcare is becoming increasingly important. The present study will therefore be followed up by a study comparing the outcome of rehabilitation of older people in primary healthcare with, vs without, a district rehabilitation centre. In conclusion, the present study demonstrates that older people with disabilities can be rehabilitated successfully by a multidisciplinary primary healthcare team working in a structured manner in a district rehabilitation centre.

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