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The road to successful geriatric rehabilitation

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CHAPTER 5

Successful geriatric rehabilitation: effects on patients' outcome of a national program to improve quality of care, the SINGER study

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ABSTRACT

Objective

To determine whether the implementation of a national program to improve quality of care in geriatric rehabilitation (GR) in the Netherlands improves successful GR in terms of independence in activities of daily living (ADL), discharge destination and length of stay.

Design

Prospective longitudinal study, comparing two consecutive cohorts: at the start of implementation (n=386) and at 1-year after implementation (n=357) of this program.

Setting/Participants

Included were 16 skilled nursing facilities, 743 patients [median age 80 years, interquartile range 72-85; 64.5% females] indicated for GR and their health care professionals (elderly care physicians, physiotherapists and nursing staff).

Intervention

National program to stimulate self-organizing capacity to develop integrated care to improve GR service delivery in 4 domains: alignment with patients' (care) needs, care coordination, team cooperation and quality of care.

Measurements

Data on patients' characteristics, functional outcomes at admission and discharge, length of stay and discharge destination, were collected via an online questionnaire sent to health care professionals. The primary outcome measure was successful rehabilitation defined as independence in ADL (Barthel Index ≥ 15), discharged home and a short length of stay (lowest 25% per diagnostic group). Generalized estimation equation analysis was used to adjust for age, gender and clustering effects in the total population and for the 2 largest diagnostic subgroups; traumatic injuries and stroke.

Results

In the total population, at 1-year postimplementation there was 12% more ADL independence [odds ratio (OR) 1.59, 95% confidence interval (CI) 1.00-2.54]. Although successful rehabilitation (independence in ADL, discharge home, short length of stay) was similar in the 2 cohorts, the subgroup of patients with traumatic injuries were more successful 1 year post-implementation (OR 1.61; 95% CI 1.01-2.54). In stroke patients, successful rehabilitation was similar between the cohorts, but with more independence in ADL in the follow-up cohort (OR 1.99; 95% CI 1.09-3.63).

Conclusions

This study shows that 1-year after the implementation of the Dutch national program to improve quality of care there was more independence in ADL at discharge, but the combined outcome of successful GR (independence in ADL, discharge home, short length of stay) was only significantly improved in patients with traumatic injuries.

Keywords

Geriatric rehabilitation, successful rehabilitation, independence in ADL, length of stay, discharge destination, quality of care

INTRODUCTION

There is an ongoing challenge to improve the quality of care for people with complex care needs, especially because health care services for patients with complex care needs are still often fragmented and not always patient centered, causing inefficiency and poor quality of care.^{1,2}

Although this challenge is also present in postacute geriatric rehabilitation (GR), very few attempts to improve the quality of GR have been reported, or their efficacy tested.^{3,4} To develop and improve GR, structural improvements are needed in the organization and process of care, for example, stimulating collaboration between health care services.^{3,5} However, quality improvement programs have mainly addressed acute or long term care settings and seldom focus on postacute GR.³

In the Netherlands, GR is provided in skilled nursing facilities (SNF) using a multidisciplinary team approach. The rehabilitation team includes an elderly care physician (ie, a qualified basic specialist specialized in geriatric medicine and rehabilitation medicine), physiotherapist, nurse, and an occupational therapist. Additional team members can include a psychomotor therapist (body and movement oriented therapist), psychologist, social worker, and speech therapist.⁶ The purpose of GR is to restore physical function, or enhance residual functional capability and participation in older patients after, for instance, a hip fracture or stroke, using a multidisciplinary team approach.⁷

In 2011 a Dutch national program was initiated aimed at improving the quality of GR care, by stimulating the self-organizing capacity of the GR service organizations to set goals to facilitate integrated care in GR in order to improve health service delivery in 4 domains (ie, alignment with patients (care) needs, care coordination, team coordination, and quality of care). Details of this national program have been described elsewhere.⁸ A GR service organization consisted of at least 1 hospital and 1 SNF providing GR.

Integrated care is defined by the World Health Organization (WHO) as “a concept bringing together inputs, delivery, management and organization of services related to diagnosis, treatment, care, rehabilitation and health promotion. Integration is a means to improve the service in relation to access, quality, user satisfaction and efficiency”.¹ Integrated care has shown potential beneficial effects on functional outcomes (increased independence on activities of daily living [ADL]) and reducing length of stay (LOS) in the hospital in stroke and trauma patients.⁹⁻¹² However, outcome measures of integrated care were mostly reported on single outcomes (such as LOS or functioning) and did not investigate a combined outcome as a proxy for successful GR in a postacute care setting. Successful GR represented by a combined outcome of independence in ADL, discharged to home with a reduced LOS, may better reflect the goals of GR which is to restore or enhance functioning and discharge to home in a short clinical rehabilitation timeframe. Therefore, the present study aimed to determine whether the implementation of a na-

tional program to improve quality of care in GR in the Netherlands improves successful GR in terms of independence in ADL, discharge destination and LOS.

METHODS

Study design

This study, referred to as the Synergy and INnovation in GEriatric Rehabilitation (SINGER) Study, was part of a national program in the Netherlands to improve the quality of health service delivery for GR. It is a prospective longitudinal study performed during the implementation of this national program comparing 2 consecutive cohorts, that is, at the start of implementation and at 1 year post-implementation of this program. Included were patients admitted for GR in an SNF and their care professionals (elderly care physician, physiotherapist and nursing staff).

The National program

The national program aimed to stimulate the self-organizing capacity of the care organizations to develop integrated GR care in order to improve health service delivery. Sixteen GR service organizations participated in the program. Such a GR service organization consisted of at least 1 hospital and 1 SNF providing GR. Each GR service organization self-developed or improved care pathways for a specific GR diagnostic group (ie, stroke, joint replacement and hip fracture), as well as for the group of other GR-diagnoses (ie, COPD, amputation, heart failure). Within the national program, the main goals of the development of integrated care focused on the 4 domains of health service delivery: (1) alignment with patient (care) needs, (2) care coordination, (3) team cooperation, and (4) quality of care.⁸

Examples of these developments were involvement of the patient and informal caregiver in setting rehabilitation goals, improving active rehabilitation culture and communication towards patients and informal caregivers, collaboration between health care providers and professionals from different care settings to improve continuity of care and patient targeting (triage) for GR, and providing education to the multidisciplinary team and stimulating knowledge exchange. Details on the national program and the design of this study are published elsewhere.⁸

Setting and participants

In all 16 participating geriatric service organizations 2 cohorts of patients were selected: a baseline cohort, that is, at the start of the national program (March-June 2011) and a cohort at 1-year post-implementation (follow-up cohort) (March-June 2012). Each SNF was asked to include a minimum of (the first) 10 to 15 consecutively admitted patients,

stratified by diagnostic group, in each cohort. For each included patient, 3 professional caregivers (elderly care physician, physiotherapist and a delegate of the nursing staff) were invited to participate.

The study was approved by the Medical Ethics Committee of the Leiden University Medical Center (LUMC).

Data collection and outcome measurements

At admission to the SNF and at discharge, information on patient characteristics, functional outcomes, LOS and discharge destination were collected via an online questionnaire among elderly care physicians, physiotherapist and nursing staff.

Successful rehabilitation

The primary outcome measure was successful rehabilitation operationalized as the combination of 3 components: (1) independence in ADL at discharge, (2) discharge home, and (3) short LOS in the GR unit. Independence in ADL was defined as having a Barthel Index (BI) of ≥ 15 at discharge.¹³ The BI has 10 items and nurses assessed the degree of support a person needs in performing ADL; scores range from 0 to 20 with higher scores indicating more independence in ADL. Discharge home was defined as discharge to the former living environment versus discharge to another setting.

A short LOS in the SNF was defined as the lowest 25% for each GR group, based on the LOS from a previous study on GR patients in Dutch SNFs (traumatic injuries ≤ 35 days, stroke ≤ 31.5 days, elective joint replacement ≤ 11.3 days, and other ≤ 25 days).⁶ The combined dichotomous outcome of successful rehabilitation was defined as independence in ADL at discharge and being discharged home with a short LOS as “successful”, when either of these criteria were not met it was defined “not successful”. The outcome for patients that died or were readmitted to the hospital was categorized as “not successful”.

Functioning

Various instruments were used to measure functioning by a physiotherapist as a secondary outcome, at admission and discharge. (In-)dependency of gait was measured with the Functional Ambulation Categories (FAC).¹⁴ The FAC is an observational instrument to distinguish 6 levels of walking ability based on the amount of physical support needed; a higher FAC score indicates more independence of gait. Additional postural control was tested for stroke patients with the performance-based Berg Balance Scale (BBS). The 14-item BBS ranges from 0 to 56, where 0 indicates the lowest level of function and 56 the highest level of function.¹⁵

Patient characteristics

The patient characteristics collected were age, sex, marital status, medical diagnosis for GR, hospital readmission rate, and number of comorbidities. The Functional Comorbidity Index (FCI) measures the sum of 18 comorbid conditions, with scores ranging from 0 (no comorbid condition) to 18 (comorbid conditions).¹⁶ The FCI was assessed by an elderly care physician.

Cognitive functioning was measured by nurses with the 7-category Minimum Data Set Cognitive Performance Scale (CPS). The CPS is a valid measure for cognitive performance and ranges from intact (level 0), borderline intact (1), mild (2), moderate (3), moderately severe (4) and severe impairment (5) to very severe impairment (level 6).¹⁷ A CPS level of ≥ 1 was defined as having an impaired cognitive performance. Depression was measured by nurses with the Depression Rating Scale, range 0-14; a score of ≥ 3 is indicative of depression.¹⁸

Statistical analysis

Baseline patient characteristics, functioning, medical indication for GR by diagnostic group, and number of comorbid conditions (FCI) were compared between the cohort at start of the implementation and the follow-up cohort using an independent t test or Mann-Whitney *U* test, depending on the distribution of the data. A p value $< .05$ was considered statistically significant.

The effect of the national program on successful rehabilitation was calculated with a 5-step generalized estimation equation (GEE) model adjusted for cluster effects ($n=16$ SNFs), age, and gender and consisted of (1) independence in ADL, (2) discharge home, (3) short LOS, (4) discharge home + short LOS, and (5) successful GR (combination of independence in ADL + discharge home + short LOS) as a dichotomous outcome. The effect on successful rehabilitation was calculated for the total population and for the 2 largest diagnostic subgroups (ie, traumatic injuries and stroke).

Differences in functional improvement measured with the BI, FAC and BBS were analysed using delta scores (ie, discharge-admission) between the 2 cohorts using the independent samples t test. Differences in median LOS were analysed with the Mann-Whitney *U* test.

Analyses were performed with SPSS for Windows, version 20.0 (IBM Corp, Armonk, NY).

RESULTS

Response

Of the 937 invited patients, 193 (20.6%) did not give informed consent to participate and 1 (0.1%) patient died before baseline measurement, resulting in 743 (79.3%) patients

(and their care professionals) eligible to participate in this study (386 in the baseline cohort, 357 in the follow-up cohort).

In the baseline cohort 26 (6.7%) participants died during rehabilitation and 29 (7.5%) were readmitted to hospital. In the follow-up cohort, 16 (4.5%) participants died and 35 (9.1%) were readmitted to hospital. This left a subgroup of 637 participants for analysis of functional improvement at discharge (331 in the baseline cohort, 306 in the follow-up cohort).

Population characteristics

Overall, 743 GR patients participated [median age 80 years, interquartile range (IQR) 72-85; 64.5% females], categorized into stroke (n=269), elective joint replacement (n=112), traumatic injuries (n=185), other diagnoses for GR (n=172) and diagnose unknown (n=5).

Table 1 presents the baseline characteristics of the participants. There were no significant differences at baseline between the 2 cohorts for sex, age, marital status and functioning.

Table 1. Baseline characteristics of the study population (n=743)

	Baseline cohort (n=386) T ⁰		Cohort at 1-year follow-up (n=357) T ¹²		p-value*
	n	%	n	%	
Socio-demographic					
Female	249	64.5	212	59.4	.15 [†]
Age in years, median (IQR)	383	80 (71-85)	354	79 (71-84)	.32
Married/living together	68	37.8	65	35.5	.66 [†]
Functioning					
Barthel index, admission (0-20), median (IQR)	359	11 (6-15)	348	12 (8-16)	.13
Functional Ambulation Categories (0-5), median (IQR)	367	3 (1-4)	352	3 (1-4)	.63
Berg Balance Scale (0-56),median (IQR) [†]	127	19 (2-38)	128	24 (4-24)	.07
CPS score (>1), % Impaired (vs intact)	107	31.3	97	28.0	.34 [†]
DRS (% DRS ≥ 3)	53	15.1	38	11.0	.11 [†]
GR groups					.84 [†]
Traumatic Injuries	93	23.3	92	25.9	
Stroke	137	35.8	132	37.2	
Joint Replacement	59	15.4	53	14.9	
Other	94	24.5	78	22.0	
FCI, median (IQR)	368	2 (1-3)	352	1(0-2)	<.001

* p-value calculated with the Mann-Whitney *u* test unless indicated otherwise.

[†] χ^2 test

[‡] Additional for stroke patients.

At admission, in the baseline cohort the median number of comorbidities measured with the FCI was 2 (IQR 1-3) and in the follow-up cohort it was 1 (IQR 0-2); $p<.001$.

Successful geriatric rehabilitation

Table 2 presents data on the effects of the national program on successful GR (including: independence in ADL, discharge to home, and short LOS) in a 5-step model adjusted for age, gender and clustering effects. In the baseline cohort, at discharge 51% of the total

Table 2. Effect of the national program on successful GR (including independency in ADL, discharge to home and short LOS) in a 5-step model adjusted for age, gender and clustering effects.

	Baseline Cohort (ref) T ⁰		Cohort at 1-y Follow-up T ¹²			P value
	n	%	n	%	OR (95%CI)	
Total population [trauma/stroke/joint replacement/other (16 SNFs)]	386		357			
Independency in ADL	258	51	348	63	1.59 (1.00-2.54)	.05
Discharge home	278	73	309	73	0.99 (0.62-1.60)	.98
Short LOS [#]	358	29	348	27	0.94 (0.61-1.45)	.78
Discharge home + Short LOS	278	27	309	26	0.96 (0.62-1.47)	.85
Successful GR: Independency in ADL + Discharge home + Short LOS	278	23	309	24	1.06 (0.63-1.77)	.81
Subgroups of interest						
Traumatic injuries (11 SNFs)	93		92			
Independency in ADL	88	53	91	65	1.63 (0.78-3.38)	.19
Discharge home	73	67	82	81	2.1 (1.32-3.23)	<.001
Short LOS (≤ 35 days)	88	38	91	32	0.76 (0.41-1.42)	.39
Discharge home + Short LOS	73	26	82	32	1.43 (1.02-2.00)	.05
Successful GR: Independency in ADL + Discharge home + Short LOS	73	22	82	31	1.61 (1.01-2.54)	.04
Stroke (12 SNFs)	137		132			
Independency in ADL	127	40	128	57	1.99 (1.09-3.63)	.02
Discharge home	91	66	113	63	0.87 (0.43-1.77)	.71
Short LOS (≤ 31.5 days)	127	26	128	25	0.92 (0.55-1.54)	.76
Discharge home + Short LOS	91	25	113	21	0.79 (0.41-1.55)	.49
Successful GR: Independency in ADL + Discharge home + Short LOS	91	20	113	19	0.97 (0.45-2.07)	.94

Ref; reference group.

[#]Short LOS defined per medical diagnosis for GR: Traumatic injuries ≤ 35 days, Stroke ≤ 31.5 days, Elective joint replacement ≤ 11.3 days; and other=25 days.

population was independent in ADL compared to 63% in the follow-up cohort (OR 1.59; 95% CI: 1.00-2.54, $p=0.05$). In the total population, successful rehabilitation was similar in both the baseline and the follow-up cohort [OR 1.06 (0.63-1.77) $p=0.81$].

Patients with traumatic injuries had more successful rehabilitation (OR 1.61; 95% CI 1.01-2.54, $p=.04$) at 1-year follow-up. The 5-step model shows that the percentage trauma patients discharged to home was higher in the follow-up cohort (67% vs 81%, $p<.001$). The percentage of trauma patients with short LOS (≤ 35 days) was similar in both cohorts ($p=.39$), as was independence in ADL ($p=.19$). In stroke patients, successful rehabilitation was similar in both cohorts, but with more independence in ADL (OR 1.99, 95% CI: 1.09-3.63; $p=.02$) in the follow-up cohort.

Additional posthoc stratified analysis showed that independence in ADL at discharge was similar in patients with high comorbidity (FCI >2 ; baseline 37% vs follow-up 50%; OR 1.72, 95% CI 1.00-2.98; $p=.05$) compared with patients with low comorbidity (FCI ≤ 2 ; baseline 58% vs follow-up 66%; OR 1.39, 95% CI 0.79-2.49; $p=.25$). Other outcomes in the 5-step model stratified for comorbidity were also similar in both cohorts.

Functional improvement

Table 3 presents data on functional improvement (delta discharge-admission SNF) and LOS in the total population not having died or being readmitted to hospital ($n=637$), and on the 2 subgroups investigated (stroke and trauma). Functional improvement was

Table 3. LOS and Functional Improvement (Delta Scores)*

	Baseline cohort (n=331)		Cohort at 1-year follow-up (n=306)		p-value [†]
	T ⁰		T ¹²		
	n		n		
LOS, median days (IQR)	328	37 (19-80)	298	35 (20-62)	.39
Traumatic injuries	79	37 (19-68)	79	41 (22-56)	.11
Stroke	111	58 (27-111)	109	49 (26.5-88.5)	.88
Functional improvement, mean (SD)					
Δ Barthel Index (0-20)	258	3.7 (4.2)	276	3.9 (4.2)	.63
Traumatic Injuries	65	4.0 (3.3)	74	5.2 (3.9)	.06
Stroke	85	4.1 (4.9)	100	3.4 (4.7)	.27
Δ Functional Ambulation Categories (0-5)	264	1.1 (1.2)	289	1.3 (1.3)	.24
Traumatic Injuries	63	1.3 (1.2)	77	1.8 (1.6)	.06
Stroke	91	1.1 (1.2)	107	1.1 (1.3)	.78
Δ Berg Balance Scale (0-65)					
Stroke	80	9.5 (11.9)	103	9.8 (13.0)	.87

*Selection of patients not having died or having been readmitted to hospital during their rehabilitation stay ($n=637$).

[†] p-value= t test except for LOS calculated with Mann-Whitney U test

similar between the baseline and follow-up cohorts for all functional outcomes. LOS was similar between the baseline and follow-up cohorts in the total population and on the 2 subgroups investigated (stroke and trauma).

DISCUSSION

This prospective cohort study explored if the implementation of a national program to improve quality of care in GR improves successful GR in terms of a combination of independence in ADL, discharge home and short LOS. Our study showed no difference in successful GR (independence in ADL, discharge home and short LOS) before and 1-year after the implementation of the national program, but also showed that there was more independence in ADL after the implementation. Moreover, in the diagnostic subgroup of patients with traumatic injuries we did find more successful GR after implementation of the national program and stroke patients had more independence in ADL at discharge after implementation.

We recently showed that this national program resulted in small improvements in team cooperation as reported by the professionals but little changes were found on patients' and informal caregivers' perceptions of the care delivery.⁸

Successful GR

The combined outcome measure for successful GR that we used was based on the overall aim of GR: to restore independence in ADL in the own home of older patients.⁷ We added the component short LOS because health care resources should be used as efficiently as possible. By combining these 3 outcomes into 1, we believe that we have better targeted 'success' than by using only 1 of these measures separately, or costs of LOS and readmission rates.^{10, 11} An even more desirable outcome of successful rehabilitation would include the patients' own rehabilitation goals and care-needs. It could also be argued that is not as important as a save and successful discharge home.

The National Program consisted of improving care coordination by developing instruments to select patients for GR (triage). Another development was to improve team cooperation in the triage process by involvement of the elderly care physician during the multidisciplinary team meeting in the hospital.⁶ This may have resulted in a selected population for GR, because the presence of the elderly care physician might increase or reduce the number of patients admitted to GR. Comparison of the baseline characteristics of the 2 cohorts shows that, in the follow-up cohort, the median number of comorbid conditions was lower compared with the baseline cohort ($p < .001$). The lower amount of comorbid conditions in the follow-up cohort might indicate a development in patient selection where more complex patients with more comorbid conditions were

not admitted to GR. Posthoc stratified analysis for comorbidity showed similar outcomes on successful geriatric rehabilitation in both cohorts. More research is required to identify which patients benefit most from GR.¹⁹

Strengths and limitations

The strength of this study lies in the rather large sample size, both in facilities as in patient numbers, next to the more holistic view we developed on successful geriatric rehabilitation.

The present study has also some limitations. The national program aimed to improve a variety of complex interfacility and interdisciplinary care structures and processes. Also, different external factors (such as societal and organizational context) could have affected rehabilitation outcomes in the study period.²⁰ This complexity could explain the small effects we found on successful GR, but also a longer follow-up period might be needed to detect change in the combined measure of discharge destination, LOS and ADL-independence.²¹ As in most complex implementation studies, it is very difficult to pinpoint specific improvement to specific components of the interventions. Future studies should examine which components of integrated care are most effective in improving successful GR outcomes.⁸

CONCLUSION

This study shows that 1-year after the implementation of the Dutch national program to improve quality of care there was more independence in ADL at discharge, but the combined outcome of successful GR (independence in ADL, discharge home, short LOS) was only significantly improved in patients with traumatic injuries.

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