Physical Medicine & Rehabilitation Journal

SCIENTIFIC LITERATURE

Special Issue Article: Stroke Rehabilitation

Research Article

Differences in Length of Stay and Therapy Hours of Inpatient Stroke Rehabilitation between 2 Rehabilitation Centers in the Netherlands

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ARTICLE INFO

Received Date: August 18, 2022
Accepted Date: September 20, 2022
Published Date: September 22, 2022

KEYWORDS

Stroke
Stroke rehabilitation
Practice variation
Therapy intensity
Therapy
Length of stay

Citation for this article: Daniëlla M Oosterveer, Iris Groeneveld, Henk J Arwert, Gerard Volker, Paulien Goossens, Thea P M Vliet Vlieland, on behalf of the SCORE-study group. Differences in Length of Stay and Therapy Hours of Inpatient Stroke Rehabilitation between 2 Rehabilitation Centers in the Netherlands. Physical Medicine & Rehabilitation Journal. 2022; 4(2):130

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ABSTRACT

Background: Practice variation of stroke rehabilitation may reflect suboptimal quality of care and has been reported across Europe and within a large country as Canada.

Objective: To investigate whether or not practice variation of inpatient rehabilitation exists within the Netherlands.

Methods: Length of stay, total therapy hours and therapy hours a week per discipline of all consecutive stroke patients admitted for inpatient rehabilitation were derived from the business administration department and compared between two Dutch rehabilitation centers (A and B) in this observational cohort study.

Results: 180 and 118 patients were included in rehabilitation centers A and B, respectively. There were no differences in length of stay (45 versus 43 days, p 0.66) and total therapy hours/week (12.8 versus 13 hours/week, p 0.82). However, there were differences in therapy amount of psychological therapy, recreational therapy, occupational therapy and speech therapy. These results remained when corrected for the available case mix variables.

Conclusions: Practice variation was found looking at therapy hours a week per discipline, but there were no differences in length of stay or total therapy hours. Effect of this variation on outcomes and costs of rehabilitation needs further elaboration to formulate best practices.

INTRODUCTION

Worldwide, stroke is one of the leading causes of disability and mortality [1]. In the Netherlands, approximately 10% of the patients hospitalized with stroke are referred to one of the specialized rehabilitation centers [2]. These rehabilitation centers provide inpatient or outpatient multidisciplinary rehabilitation treatment based on evidence-based guidelines [3]. Evidence-based stroke management and stroke rehabilitation guidelines have been implemented in many countries to improve quality of care [3,4]. Although these guidelines diminish practice variation by offering for example a minimum of therapy hours a day needed, there is still room left for practice variation and with that, potential differences in quality of care. Quality of care has been described by Donabedian in terms of structure i.e. 'attributes of settings

in which health care occurs', process i.e. 'what is actually done in giving and receiving care', and outcomes i.e. 'health status of patients and populations' [5]. Practice variation has previously been described according to these terms.

In terms of structure of stroke rehabilitation, practice variation was found in 4 rehabilitation centers in the Netherlands [6]. There were differences in admission, exclusion and discharge criteria, patient subgroups, care pathways, maximum time to admission, health professionals, treatment facilities and caregiver involvement.

In terms of process of stroke rehabilitation, practice variation was found across European rehabilitation centers for therapy hours [7,8], time between stroke and start of rehabilitation [9], length of rehabilitation [9] and provision of follow-up services after inpatient stroke rehabilitation [10]. Differences in health care systems and reimbursement policies across countries might explain this practice variation. However, a large study including 11,983 patients in Canada showed regional differences in inpatient stroke rehabilitation length of stay, while accounting for differences in patient characteristics [11]. This might indicate that practice variation in the process of stroke rehabilitation can exist within a country with the same healthcare system and reimbursement policies.

These results about differences in stroke rehabilitation care across and within countries led to our question if this variation in process also exists between rehabilitation centers in the same region in the Netherlands, indicating possible differences in quality of care. As the Netherlands is a relatively small densely populated country, some stroke rehabilitation centers are located close to each other. In this study, we therefore aim to investigate whether or not there are differences in the length of stay, total therapy hours, and therapy hours a week for each discipline of stroke patients in two Dutch rehabilitation centers located 20km from each other, correcting for case mix variation.

METHODS

Setting

This study is part of the ongoing observational, prospective Stroke Cohort Outcomes of Rehabilitation (SCORE) study started March 10, 2014 [12] (Dutch Trial Register no. 4293). This study collects data from stroke patients who receive multidisciplinary rehabilitation in two Dutch rehabilitation centers, here called A and B. The study was approved by the Medical Ethics Committee of the Leiden University Medical Center. The study was conducted in compliance with the Declaration of Helsinki [13] and reported in accordance with the STROBE guidelines [14]. All patients signed informed consent before participation in the study. The design of the study, as well as its outcomes have been described in a previous publication [12].

Rehabilitation centers A and B are located about 20 kilometres apart from each other. In rehabilitation center A work approximately 500 persons and in rehabilitation center B approximately 300 persons, providing inpatient and outpatient rehabilitation for patients with stroke and with other diagnoses. The number of patients with stroke treated yearly is on average 250 and 100, in A and B respectively. Rehabilitation care is provided by a multidisciplinary team, including physical therapists, sports therapists, occupational therapists, speech therapists, psychologists, psychology assistants, recreational therapists, social workers, sexologists and dieticians. In center A a music therapist is a member of the team, whereas center B a clinical linguist is included. Therapy is given individually and in groups in both rehabilitation centers. Most therapy is given during working days. On Saturdays there is limited provision of therapy in B and no therapy in A. In both rehabilitation centers there is no therapy on Sundays nor during national holidays.

Study population

According to the protocol of the SCORE study, all consecutive stroke patients were invited within the first two weeks after admission to the rehabilitation center. Patients were included when they were diagnosed with a first or recurrent stroke no more than six months ago and aged ≥18 years. Patients with dementia or a psychiatric disorder and patients that were unable to complete questionnaires in Dutch were excluded from the study.

The analyses on practice variation only concerns inpatients included until August 31st, 2016.

Measurements

Sex, age, date of stroke, stroke type and stroke localisation were derived from the medical files of the rehabilitation centers. Ethnicity, education level, living situation and employment were collected through a standardized questionnaire. Comorbidities were determined by the Dutch

Life Situation Cohort Questionnaire (Permanent Onderzoek naar de LeefSituatie), comprising 16 chronic diseases, including diabetes, hypertension and heart disease [15]. Functional dependence upon admission and at discharge was measured with the Barthel Index, a score ranging from 0 (e.g. totally dependent) to 20 (e.g. totally independent) [16].

The outcomes included: 1) length of stay in days, 2) total therapy amount in hours, and 3) therapy amount in hours a week per discipline. Length of stay was defined as the number of days in which nursing care was provided in the rehabilitation center. Days, where patients were 24h absent because of hospitalization during rehabilitation or because of weekend leave were not included. Total therapy amount was defined as the total number of therapy hours received during inpatient stay and a week during inpatient stay. In addition, therapy amount in hours a week per discipline during inpatient stay was calculated for: a) physical therapy (provided by a physical therapist or sports therapist), b) occupational therapy, c) speech therapy (provided by a speech therapist or clinical linguist), d) psychology (provided by a psychologist or psychology assistant), e) recreational therapy, f) social work, g) sexologist and h) dietician and i) music therapy.

These data on length of stay and therapy hours were derived from the business administration departments of each rehabilitation center. The same program was used for business administration in both rehabilitation centers. Group therapy hours were registered in this business administration as hours divided by the number of patients that participate in the group therapy.

Statistical analysis

All data were anonymized when entered in a database and were analyzed with IBM SPSS 24.0 for Windows. A two-sided p-value of 0.05 was considered statistically significant. Age and sex were compared between participants and non-participants, using a Mann-Whitney U Test and Fishers' exact test.

Baseline characteristics were described using medians (range) or means (standard deviation), and percentages, depending on the nature of the variables and their distribution. Baseline characteristics were compared between the rehabilitation centers using parametric or nonparametric tests where appropriate. Participants with incomplete treatment data were excluded from the analyses. Length of stay, total therapy hours and therapy hours a week per discipline were computed for both rehabilitation centers. To assess the association of these outcomes with the rehabilitation center, univariate regression analyses were used.

To assess whether or not the location (rehabilitation center A (=0) or B (=1)) was associated with length of stay, total therapy hours (total hours and total hours/week) and therapy hours a week per discipline when corrected for case mix variation, multivariable regression analyses were done. Based on previous research [17-19], we identified potential factors associated with our outcomes and we used these factor to correct for case mix variation in the regression analyses: sex (male = 1), age at admission (in years), level of education (middle and high (=0) versus low (=1)), living situation (alone (=0) versus together (=1)), type of stroke (hemorrhagic (=0) versus ischemic (=1)), Barthel index, pre-stroke heart disease (present =1), the number of days between stroke and admission to the rehabilitation center, total therapy amount (in analyses with length of stay), and length of stay (in analyses with total therapy hours). All Spearman's correlation coefficients between the included variables were < 0.70, indicating that no multicollinearity exists. Because length of stay and therapy hours (total and per discipline) were not normally distributed, log transformed data were used for both the univariate and multivariate regression analyses.

RESULTS

Between March 10th, 2014 and August 31th, 2016, 485 patients were invited, and 303 of these 485 patients gave informed consent. Of five patients the exact length of stay was unclear. Complete treatment data were available for 298 patients (61.4% of invited): 180 patients in rehabilitation center A and 118 in rehabilitation center B. When comparing participants (n=298) and non-participants (n=187), no statistically significant differences in age (mean (range): 65.5 years (19-84) versus 62.0 years (19-87), *p* 0.10) or sex (58.7% versus 51.9% men, *p* 0.08) were found.

In Table 1 the patient characteristics are shown for each rehabilitation center. We did not find significant differences in characteristics of the stroke patients between the two rehabilitation centers.

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Table 1: Baseline characteristics of the included stroke patients upon admission in each rehabilitation center.

	Rehabilitation Center A N =180		Rehabilitation Center B N = 118		*p*-value
	N		N		
Male sex, N (%)	180	98 (54.4)	118	76 (64.4)	0.09
Age in years, mean (SD)	180	60.2 (12.8)	118	61.3 (11.9)	0.28
Ethnicity Native Dutch, N (%) Western immigrant, N (%) Non-western immigrant, N (%)	157	 120 (76.4) 18 (11.5) 19 (12.1)	103	 85 (82.5) 12 (11.7) 6 (5.8)	0.24 Native versus non-native: 0.43
Educational level Low, N (%) Medium, N (%) High, N (%)	158	 72 (45.6) 43 (27.2) 43 (27.2)	105	 50 (47.6) 24 (21.9) 32 (30.5)	0.61 Low vs medium or high: 0.82
Living together, N (%)	158	106 (67.1)	106	78 (73.6)	0.34
Employed, aged ≤65, N (%)	91	61 (67.0)	51	41 (80.4)	0.09
Ischaemic stroke, N (%)	180	136 (75.6)	117	88 (75.2)	0.95
Stroke localisation Left, N (%) Right, N (%) Other, N (%)	175	 76 (43.4) 85 (48.6) 14 (8.0)	116	 59 (50.9) 43 (37.1) 14 (12.1)	0.12
Barthel Index at admission, median (range)	123	16.0 (1-20)	107	15.0 (1-20)	0.56
Barthel Index at discharge, median (range)	96	20.0 (5-20)	29	20.0 (15-20)	0.04
Pre-stroke hypertension, N (%)	151	63 (41.7)	99	40 (40.4)	0.84
Pre-stroke diabetes, N (%)	152	27 (17.8)	100	12 (12.0)	0.22
Pre-stroke heart disease, N (%)	143	31 (21.7)	96	13 (13.5)	0.11
Days between stroke and rehabilitation center admission, median (range)	162	10 (3-48)	112	10 (3-48)	0.91

An overview of the process of rehabilitation in both centers is shown in Table 2. The length of stay, total hours of inpatient therapy and total hours of therapy a week did not differ significantly between both rehabilitation centers (45 versus 43 days, *p* 0.66; 81.6 versus 82.9 hours, *p* 0.71; 12.8 versus 13 hours a week, *p* 0.82, respectively). Multivariate regression analysis demonstrated that when corrected for case mix variation, the location of rehabilitation, i.e. rehabilitation center A or B, was not significantly associated with length of stay or total therapy hours (Exp(β) 0.99, 95%CI 0.87-1.12, p 0.84, Exp(β) 0.99, 95%CI 0.93-1.06, p 0.79, respectively).

There were significant differences between the centers in therapy amount per discipline as expressed in hours per week. The numbers of hours of occupational therapy, speech therapy, psychological therapy and recreational therapy differed significantly between the two centers (3.4 versus 3.8 hours a week, 1.0 versus 1.8 hours a week, 1.4 versus 1.1 hours a week, 1.1 versus 0.7 hours a week; all $p<0.01$), whereas hours of physical therapy and social work were similar (4.1 versus 4.1 hours a week, *p* 0.64; and 0.9 versus 0.9 hours a week, *p* 0.73). Multivariate regression analyses showed that the differences in therapy hours of these disciplines found in the univariate analyses remained significant after correction for the available case mix variation.

Table 2: Delivery of care to stroke patients admitted to two rehabilitation centers.

	Rehabilitation center A N = 180 Median (range)	Rehabilitation center B N = 118 Median (range)	Exp(β) (95%CI) *p*-value univariate regression LN data	Exp(β) (95%CI) *p*-value multivariate regression LN data
Length of stay (days)	45 (14-138)	43 (11-155)	0.97 (0.99-1.09) 0.66	0.99 (0.87-1.12) 0.84
Total hours therapy during inpatient rehabilitation	81.6 (18.0-262.4)	82.9 (15.0-359.3)	0.99 (0.86-1.14) 0.85	0.99 (0.92-1.07) 0.85
Total hours therapy/week	12.8 (6.0-34.8)	13.0 (7.9-25.1)	1.01 (0.96-1.06) 0.71	0.99 (0.97-1.13) 0.25
Physical therapy (hours/week)*	4.1 (1.1-13.9)	4.1 (1.8-7.3)	0.99 (0.92-1.05) 0.64	0.96 (0.90-1.03) 0.28
Occupational therapy (hours/week)	3.4 (1.2-10.0)	3.8 (2.1-8.8)	1.11 (1.06-1.17) <0.001	1.08 (1.02-1.16) 0.016
Speech therapy (hours/week)**	1.0 (0-7.3)	1.8 (0.2-5.7)	1.28 (1.15-1.42) <0.001	1.27 (0.100-0.373) 0.001
Psychology (hours/week)#	1.4 (0-5.1)	1.1 (0-3.9)	0.87 (0.80-0.86) 0.001	0.86 (0.77-0.95) 0.004
Recreational therapy (hours/week)	1.1 (0.1-3.7)	0.7 (0-3.0)	0.80 (0.73-0.86) <0.001	0.83 (0.75-0.92) 0.001
Social worker (hour/week)	0.9 (0-5.0)	0.9 (0-2.5)	0.99 (-0.064-0.045) 0.73	1.00 (0.92-1.07) 0.92
Sexologist (hours/week)	0.1 (0-1.1)	0 (0-0.3)	0.94 (0.85-0.90) <0.001	0.86 (0.83-0.89) <0.001
Dietician (hours/week)	0.1 (0-1.4)	0.2 (0-1.0)	1.09 (1.05-1.13) <0.001	0.091 (0.045-0.137) <0.001
Music therapy (hours/week)	0.0 (0-1.6)	absent	0.88 (0.85-0.92) <0.001	0.88 (0.84-0.92) <0.001

*Physical therapy included therapy provided by a physical therapist and sports therapist

**Speech therapy included therapy provided by a speech therapist and a clinical linguist

#Psychology included therapy provided by a psychologist and psychology assistant

Although the amount of time patients were treated by a sexologist, dietician or music therapist was low (Table 2), there were large differences in the proportions of patients seen by these therapists between the rehabilitation centers: 77.8% of the patients in rehabilitation center A were guided by a sexologist with 1 patient (0.6%) > 1 hour a week, while only 2.5% of the patients in rehabilitation center B and no one received > 1 hour/week. Music therapy was only available in rehabilitation center A and was used in 70% of the patients and in 6 patients (3.6%) for > 1 hour a week. A dietician was involved in 83.3% of the patients of rehabilitation center A and in 95.8% of the patients of rehabilitation center B.

DISCUSSION

This observational cohort study shows that there is practice variation in the process of stroke rehabilitation looking at

amount of hours a week per discipline that stroke patients receive in two Dutch rehabilitation centers: the amount of hours of therapy given by an occupational therapist, speech therapist, psychological therapist, recreational therapist, sexologist, dietician and music therapist was different, even when accounting for case mix variation. Although distribution of these hours over various therapies varied between the rehabilitation centers, stroke patients received similar total therapy hours of inpatient multidisciplinary rehabilitation and their length of stay in both rehabilitation centers was comparable, taking the available case mix variables into account.

These results indicate that practice variation also within a country exists, even when the rehabilitation centers are located near each other. Our study population is smaller than previous studies, but our results are in line what was previously seen across countries and between large regions within countries.

A strong aspect of our study is the fact that we included all therapy disciplines, yielding a comprehensive picture of therapy hours. In addition, our sample size can be considered sufficient for performing the regression analyses with multiple variables [20].

Both rehabilitation centers provided treatment according to the Dutch rehabilitation guidelines, recommending that physical and occupational therapy time should be at least 40 to 60 minutes daily. The total amount of therapies (12.8 and 13 hours a week) was in the mid-range compared to four other countries as described by de Wit et al. [7], who found therapy intensities ranging from 8.82 till 23.40 hours a week. It must however be taken into account that the total therapy hours in our study is likely to be underestimated because group therapy time was divided by the number of patients attending the group therapy and the time spent in groups was not known for both centers. This is a limitation of using business administration data. This data collection methods also lacks detailed information about what was done during these therapy hours.

Although we adjusted for available relevant case mix variables in our analyses it cannot be ruled out that the observed difference between the hours a week of occupational therapy, speech therapy and psychologic therapy between the two centers was related to differences in cognitive functioning, mood, aphasia and motor function. Previously, Wee et al. demonstrated that admission balance, aphasia and the number of impairments did influence the length of stay [18]. These factors were not registered in a consistent manner, although in both centra patients with severe cognitive impairments and aphasia that were not able to complete questionnaires were excluded. Differences in experience and training of therapists might also contribute to differences in hours of specific therapy; these factors were also not available for our analyses. Alternatively, the differences in hours of these therapies might be explained by overlapping goals between therapists: for example recreational therapy might partially replace occupational therapy; and music therapy might allow less speech therapy.

Most strikingly, were the differences in numbers of patients treated by a sexologist, dietician and music therapist. These therapists are not mentioned explicitly in the current Dutch stroke guideline [3] and these results show that this leads to practice variation. Each rehabilitation center seems to have its own vision concerning the availability and provision of these therapies. Rehabilitation center A offers patients a standard appointment with their sexologist and has a music therapist, while in rehabilitation center B the dietician sees almost all patients. Differences in availability of specific therapists was previously found throughout four rehabilitation centers in the Netherlands, however this study did not look at in how many patients and how many hours these therapists were used [6].

It would be of interest to investigate whether or not differences in therapy hours lead to differences in outcomes. However, this was not the aim of our current study. In a small subsample of our population the Barthel Index at discharge was available, showing a more favorable outcome in rehabilitation center B (20.0 versus 20.0, p 0.04). However, because of a large number of missing values, no firm conclusions can be made and further research is needed.

CONCLUSION

In conclusion, although length of stay and total therapy hours were not different in two Dutch rehabilitation centers, the time distribution between different therapies and the use of some specific therapies was different, even when correcting for patient and stroke characteristics and Barthel Index at admission. Further investigation is needed to explore the effects

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of this variation on outcomes and costs of rehabilitation to formulate best practices.

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