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Original Study

The Influence of Activity-Based Funding on Treatment Intensity and Length of Stay of Geriatric Rehabilitation Patients

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A B S T R A C T

Aim: Little is known about the impact of activity-based funding (ABF) to increase treatment intensity and decrease length of stay (LOS) of inpatient geriatric patients. In January 2014, ABF was implemented in The Netherlands with the aim to increase treatment intensity and shorten LOS in geriatric rehabilitation (GR).
Objectives: To describe the influence of ABF on treatment intensity and LOS of inpatient GR patients before and after ABF was implemented.
Design: Population-based, retrospective cohort study.
Setting: Thirty nursing homes providing inpatient GR across The Netherlands.
Data Collection: Digital medical records of patients who had received inpatient GR in Dutch nursing homes across The Netherlands were studied between January 1, 2013 and March 14, 2016. We calculated the mean treatment intensity in hours per week and median LOS in days in 3 cohorts according to the year of admittance. In addition, a historical representative cohort of GR patients who were admitted in 2007 was studied that represented the situation before the ABF reform was announced (eg, funding with a fixed price per day). In 2013, the funding with a fixed price per day was still in use but with compulsory ABF registration. In 2014 and 2015, the ABF was fully implemented.
Statistical differences in treatment intensity and LOS were calculated between patients admitted in 2007 and 2013, 2013 and 2014, and 2013 and 2015. Statistical significance was set at a P value of $<.02$ (Bonferroni correction $P = .05/3$). Discharge destinations of patients discharged from March 1, 2015 to January 1, 2016 could be obtained and compared with 2007.
Results: The treatment intensity and LOS of 16,823 GR patients could be obtained and compared with the historical cohort from 2007 ($n = 2950$). Patients who were admitted in the year 2013 received higher treatment intensities and had the same median LOS compared with 2007. After the implementation of ABF in January 2014, the mean treatment intensity increased significantly by 37% (3.8 hours/week in 2013, 4.7 hours/week in 2014, and 5.2 hours/week in 2015). This trend was significant across all rehabilitation diagnoses. After the implementation of ABF, the median LOS decreased significantly by 7 days (46 days in 2013, 42 days in 2014, and 39 days in 2015), which was consistent in all rehabilitation categories except for patients with a total joint replacement or amputation.
Conclusions: Patients who received inpatient GR after introduction of ABF received higher treatment intensities and had a shorter LOS compared with the year before implementation.

Inpatient geriatric rehabilitation (GR) is an effective intervention to improve functional activity, prevent permanent nursing home admissions and mortality of vulnerable elderly patients admitted to the hospital.[1] In The Netherlands, inpatient GR is solely provided by nursing homes. The government provided funding, with a fixed price per day and a maximum length of stay (LOS) of 6 months. In 2008, the Dutch government began to prepare a change to health insurance payment by means of activity-based funding (ABF), which was finally implemented from January 1, 2014. ABF is an umbrella term for a type of funding on the basis of distinct diagnosis-based treatment episodes that is known by many synonyms internationally.[2] ABF is a political policy tool to reshape incentives in the provision of healthcare. In The Netherlands, ABF was adopted to facilitate both short and variable

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intensive treatments during GR. Incentives were realized by providing higher negotiable prices for high treatment intensities in combination with a short LOS.[3] Compulsory ABF registration was introduced but not financially implemented in the year 2013; ABF payment was financially applied starting January 1, 2014 in Dutch nursing homes offering inpatient GR. Until now, no international data is available about the impact of both financial incentives to increase treatment intensity and to decrease LOS during GR. Electronic patient records that hold basic information about GR can shed light on treatment intensity, LOS, and discharge destinations of GR patients. Therefore, the aim of the present study is to provide insight in trends in treatment intensity, LOS, mortality, and discharge destinations of GR patients who were admitted shortly before and after the institution of ABF in GR and to compare it with a historical cohort of GR patients from 2007, before ABF was announced.[4]

Methods

Study Population

The study population consisted of 16,823 patients who were admitted to Dutch inpatient GR institutions across The Netherlands between January 1, 2013 and January 1, 2016. We analyzed patient data originating from all 30 nursing homes across The Netherlands, which made use of the electronic health record system of Gerimedica Ltd (Amsterdam, The Netherlands). All participating institutions gave their consent in providing anonymous patient data from the electronic health record system of Gerimedica Ltd. The Medical Ethics Committee of the VU Medical Center approved the study with a waiver of informed consent. Patients admitted before January 1, 2016, were followed until the extraction date on March 14, 2016. Patients that were not discharged at March 14, 2016 were excluded from analysis. In addition, patients who were admitted more than once were excluded from analysis (3.7%) because the electronic health record data was not indexed for each stay period. The study population included patients who were labeled for GR (in the electronic health record) by the attending elderly care physician. Patients that were admitted in the year 2013 were labeled as being admitted before the ABF was implemented but was registered, and the cohorts who were admitted in 2014 and 2015 were labeled as being admitted after the implementation of ABF. The historical cohort of 2007 (for comparison) consisted of a representative sample of 2950 GR patients from The Netherlands. This cohort was originally used to estimate the size, character and duration of GR in The Netherlands.[4]

Data Collection

Data was extracted from the electronic patient record system named YSIS on March 14, 2016. Data from the historical cohort of 2007 was extracted from the published report. Because mean age was only reported for men and women separately, the first author of this report was asked to additionally supply information about mean age and the standard deviation of the entire group. Treatment intensity and LOS of all patients, including those of the historical cohort, were presented according to the year of their admittance. The following patient characteristics were obtained: age, sex, marital status, original living place, year of admittance, main rehabilitation diagnosis, and the number of patients who received outpatient rehabilitation at the end of their inpatient stay. At discharge, the following patient outcomes were extracted: LOS (including outpatient stay which is maximal 12 weeks), inpatient mortality, treatment intensity registered by physicians, physiotherapists, occupational therapists, dietitians, social workers, psychologists, speech therapists, spiritual caretakers, recreational therapists, and music therapists in hours per week. In addition, the following treatment activities by nurses were registered: wound treatment, indwelling catheter placement and flushing, ventilation support, central venous catheter care, enteral feeding care, and guidance of behavioral problems. Information regarding treatment intensity from 2007 consisted of the treatment provided by the aforementioned therapists and high-qualified nurses such as nurse practitioners.

Discharge destinations were structurally registered from March 1, 2015 to January 1, 2016. The treatment intensity was calculated by the inbuilt time registration application of the electronic health record system that prompted the user to register the duration of treatment after each patient-related entry in the patient health record.

Analysis

Trends in patient characteristics and outcomes between the cohort of 2013 and the other cohorts (2007, 2014, 2015) were calculated (3 comparisons). Differences in categorical variables were analyzed using the χ^2 test. For normal distributed continuous variables the Student *t* test was performed and the Mann-Whitney U test for not Gaussian distributed variables. Differences of *P* values of $<.02$ were regarded significant because of a Bonferroni correction attributable to 3 comparisons between the cohorts; $P = .05/3$. Data was extracted from the electronic patient record system by means of data-extraction software Kibana v 4.4.2 (Elastic Inc, Sacramento, CA) and analyzed by SPSS v 20. (SPSS Inc, Chicago, IL).

Results

Distribution of Patients

Figure 1 shows the place of residences of the study patients across The Netherlands. When comparing patient characteristics between the urban regions (Noord Holland, Zuid Holland and Utrecht) and more rural regions, no statistical significant differences in sex, age, LOS, treatment intensities, and outcome (rate of returning home) were found.

Trends in Patient Characteristics

The proportion of female patients and mean age significantly decreased from 67% and 79.6 years in 2007 to 64% and 78.5 years in 2013 (Table 1). The distribution of main rehabilitation diagnoses showed a significant proportional decline of patients with stroke or with a total joint replacement in 2013 compared with 2007 ($P < .02$). The proportion of stroke patients decreased further in 2014–2015 in favor of patients with miscellaneous diagnoses ($P < .02$).

Trends in Treatment Intensity and LOS

The total mean treatment intensity in hours per week differed significantly between the historical cohort of 2007 and 2013 (3.3 hours/week and 3.8 hours/week, respectively; $P < .02$). Compared with 2013, treatment intensity significantly increased further to 4.7 hours/week and 5.3 hours/week in, respectively, 2014 and 2015 ($P < .02$). Trends in treatment intensity during 2007, and 2013–2015 are shown Figure 2 and Table 2. Overall, in all rehabilitation diagnoses a significant increase in treatment intensity was present between 2013, 2014, and 2015 (Appendix 1). There was no difference in LOS between 2007 and 2013. Compared with 2013, the median LOS decreased with 7 days from 46 to 39 days in 2015 ($P < .02$), which was consistent in all rehabilitation categories except for patients with a total joint replacement or amputation in which trends in LOS were not significant (Table 2 and Appendix 1).

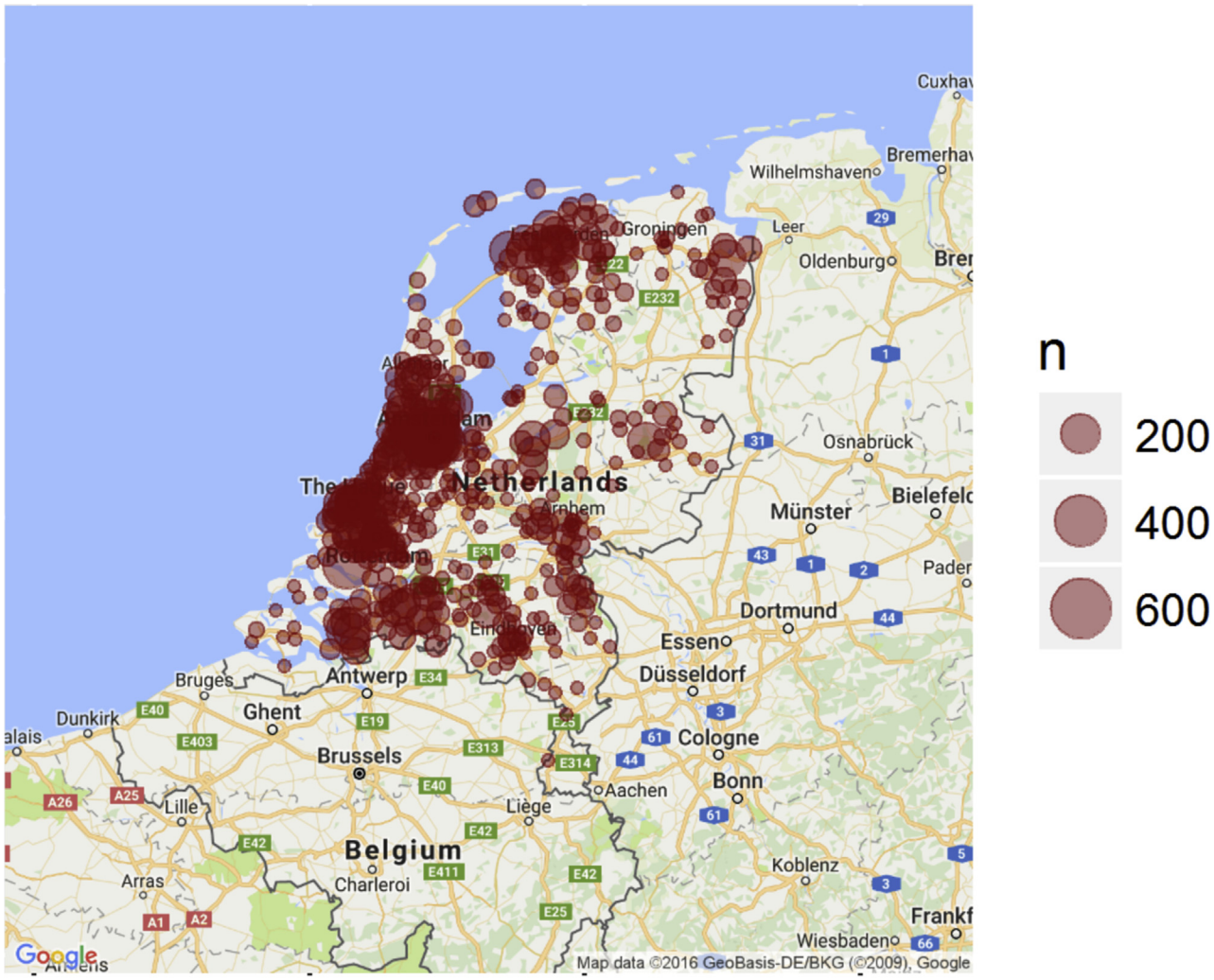

Fig. 1. Distribution of the study population (n = 16,823). 361 (2.1%) patients had an unknown zip code.

Trends in Rehabilitation Outcome

Mortality during inpatient GR stay was 10% in 2007 and significantly decreased to 5% in 2013 (Table 2). Mortality rates of patients admitted in the years 2013-2015 remained 5%. The percentage of patients who were discharged to their homes from March 1, 2015 to January 1, 2016 was significantly higher than of patients discharged in 2007 (57% and 76%, respectively, $P < .02$; Table 3). The mortality rate decreased (10% and 5.6%, respectively). This trend was consistent across the 4 main rehabilitation diagnoses categories (Appendix 2).

Discussion

The implementation of ABF in GR in The Netherlands in January 1, 2014 was accompanied by a significant increase in treatment intensity and, to a lesser degree by a decrease in LOS.

Comparison With Previous Literature

Little is known about the effects of ABF on simultaneously stimulating a higher treatment intensity and lower LOS in postacute rehabilitation settings. However, 2 reviews evaluated the effect of ABF on LOS of patients admitted to hospital or rehabilitation settings. In hospital settings, it has been demonstrated that ABF decreases hospital LOS and increases the amount of patient transfers to out-of-hospital care.[5] A systematic review of O'Brien[6] (2010) described trends in LOS of stroke rehabilitation patients before and after the implementation of ABF in the United States and concluded that the effects of ABF on LOS are inconsistent. It has been demonstrated that a major reduction in LOS of patients with stroke and other diagnoses had already taken place before the institution of ABF in the rehabilitation setting in the United States in 2002.[6,7]

Interpretation and Mechanisms

The reduction in the LOS could be explained by the observed accompanied higher intensity of treatment. However, the literature is inconclusive about the potential positive effect of higher intensity of treatment on LOS possibly because of the huge variation in LOS caused by patient- and service-related factors.[8,9] It has been demonstrated by a meta-analysis of individual patient data that only after adjusting for severity of disability, age, comorbidity, and healthcare site, there is a significant independent relationship between treatment intensity and LOS in stroke rehabilitation patients.[9] In the present study, the reduction in median LOS was significant despite that the 25th percentile almost remained unchanged during 2013–2015 (25th percentiles around 20 days; Figure 3). We assume that reduction in LOS in the present study was mostly realized by discontinuing

Table 1
Patient Characteristics of the Study Population

Year of admission	Historical Cohort	Study Cohorts		
	2007*	2013	2014	2015
Type of funding	Fixed day price	Fixed day price	ABF	ABF
Number of patients	2950	3994	4838	7991
Sex, n (%) female	1970 (67)	2480 (62)†	3075 (64)‡	5077 (64)‡
Marital status				
N (% of valid data)				
Married	No data	1059 (35)	1084 (34)	1751 (37)
Registered partnership		22 (0.7)	20 (0.6)	40 (0.8)
Unmarried		701 (23)	649 (20)	923 (20)
Widow/widower		1276 (42)	1427 (45)	2019 (43)
Unknown		936 (23)	1658 (34)	3258 (41)
Age at admission	2950	3596	4354	7125
Mean (SD)	79.6 (9.9)	77.9 (11)†	78.1 (11)	78.5 (11)‡
Range	22–102	19–104	22–106	17–101
Rehabilitation diagnosis	2914*	3994§	4838‖	7991‖
N (%)				
Stroke	710 (24)	811 (20)	835 (17)	1257 (16)
Total joint replacement	590 (20)	576 (14)	686 (14)	1170 (15)
Traumatic injury	746 (26)	1114 (28)	1384 (29)	2395 (30)
Amputation	40 (1.4)	109 (2.7)	93 (1.9)	177 (2.2)
Miscellaneous diagnosis	828 (28)	1384 (35)	1840 (38)	2992 (37)
Number of patients with outpatient treatment after inpatient rehabilitation				
N (%)	None	54 (1.4)	111 (2.3)‡	271 (3.4)‡

*n = 36 patients (1.2%) had no rehabilitation diagnosis therefore data for these patients is not included.
†Significant different compared with 2007; $P < .02$.
‡Significant different compared with 2013; $P < .02$.
§Distribution of diagnoses significant different from 2007; $P < .02$.
‖Distribution of diagnoses significant different from 2013; $P < .02$.

Table 2
Trends in Treatment Intensity, LOS, and Mortality

	Historical Cohort	Study Cohorts		
	Fixed Day Price		ABF	
	2007	2013	2014	2015
Treatment intensity, n	299	3976	4823	7974
Mean hours/ week (SD)	3.3 (2.3)	3.8 (2.8)*	4.7 (3.0)†	5.2 (3.7)†
Length of rehabilitation stay, n	2950	3994	4838	7991
Median (IQR)	47 (23–84)	46 (22–88)	42 (21–73)†	39 (21–65)†
Mortality during rehabilitation stay, total n	2909	3994	4838	7991
Deceased, n (%)	305 (10)	197 (4.9)‡	249 (5.1)	376 (4.7)

IQR, interquartile range; SD, standard deviation.
*Significant different compared with 2007 (*t* test $P < .02$).
†Significant different compared with 2013 (Mann-Whitney U test; $P < .02$).
‡Significant different compared with 2007 (χ^2 test; $P < .02$).

rehabilitation of patients with a relatively high LOS because the ABF reaches its maximum price when patients are staying longer than 92 days, thus, discouraging LOS over 3 months. This encourages proactive discharge planning (eg, just before LOS of 3 months), setting a provisional discharge date at admission, which has proven to reduce LOS of GR patients.[10,11]

Developments already taking place before the implementation of ABF could also have influenced the observed trends in LOS, treatment intensity, and discharge destination. It is remarkable that despite the decreasing trend of hospital LOS (−17%) in The Netherlands during 2007–2012 the LOS in GR did not change.[12] One would expect a compensatory increase in LOS of the consecutive rehabilitation period, which we could not observe when comparing the LOS of rehabilitation patients between 2007 and 2013. This may imply that practices in

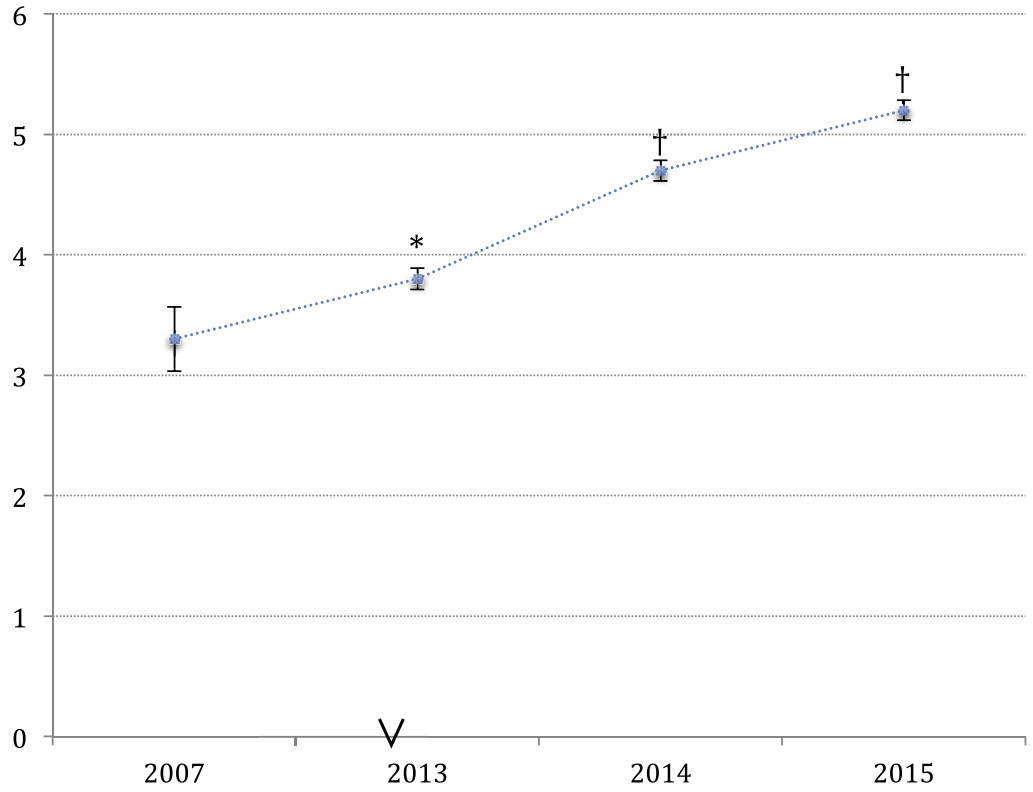

Fig. 2. Trends in treatment intensity in mean hours per week. Error bars represent 95% confidence intervals of the standard error of the mean (SEM). * Significant difference between 2007 and 2013 ($P < .02$). † Significant different compared with 2013 ($P < .02$).

Table 3
Change in Discharge Destinations Between 2007 and 2015

Outcome at Discharge, n (%)	Historical Cohort	Study Cohort
	Fixed Day Price	ABF
	Discharged in 2007	Discharged between March 1, 2015 and January 1, 2016
Outcome of inpatient rehabilitation registered, n (%)	2909 (100)	5536 (71)
Home (eg, original living place)	1658 (57)	4208 (76)
Permanent nursing home admission	314 (11)	561 (10)
Relocation to another inpatient geriatric rehabilitation location	50 (1.7)	23 (0.4)
Readmission to hospital	207 (7.1)	216 (3.9)
Other, including (private) residential care facilities	375 (13)	219 (4.0)
Deceased during inpatient stay	305 (10)	309 (5.6)
All discharge destinations	2909 (100)	5536 (100)

reducing LOS in GR were already present before ABF was implemented.

Our observation of a ≈33% increase in the rate of returning home and an almost 50% drop in mortality of GR patients comparing 2007 with 2015 could be explained by active selection of patients who can sustain high treatment intensities and have a high probability of returning home. Lastly, simultaneously implemented policies in public healthcare could explain the reduction in LOS of GR during 2013–2015. For instance, with the nationwide policy of enabling the district nurse to assess the needs of patients and to coordinate care in their own neighborhood could also explain the shorter LOS and higher rate of returning home after GR.[13]

Clinical Relevance

We demonstrated an increase in treatment intensity and decrease in LOS of inpatient GR patients after ABF implementation. The positive influence of ABF on LOS will likely reduce healthcare costs of GR. The observed trend toward individually tailored higher treatment intensities by ABF could also lead to better rehabilitation outcomes as has been demonstrated in inpatient rehabilitation patients.[8,14] Because increased treatment intensity is only a surrogate outcome of a better rehabilitation outcome, our study can only provide indirect evidence that the quality of rehabilitation treatment has increased after the implementation of ABF. More insight into the relationship between treatment intensity and outcome could be obtained by performing well-controlled dose-response studies. Future observation studies should analyze the prescribed intensity of therapy, the offered therapy, and actual time spent exercising to address the question whether all patients could sustain and benefit from increased therapy intensity. At present, it is not entirely clear whether more therapy automatically leads to a better functional outcome of rehabilitation patients, especially for frail older patients with unstable medical conditions as in our present study.

Strengths and Weaknesses

We collected a large representative sample of Dutch geriatric patients (≈20% of all patients in 2015 who had undergone inpatient GR in nursing homes across The Netherlands).[15] The findings can, therefore, be generalized to all inpatient geriatric patients in The Netherlands who have been admitted for the first time for GR (Figure 1). We did not include patients who had undergone 2 or more rehabilitation periods because of technical difficulties to extract this

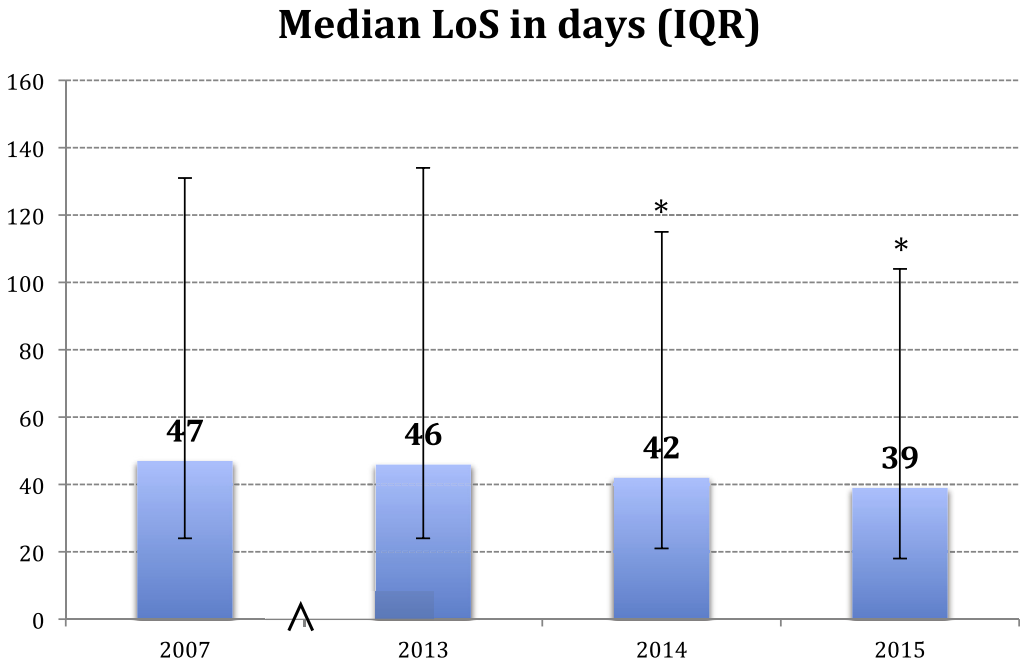

Fig. 3. Trends in LOS in median days. Error bars represent the IQR (interquartile range). *Significant different compared to 2013 (Mann-Whitney U test; $P < .02$), note that no statistical testing between the historical cohort of 2007 and 2013 could be performed because of lack of raw data.

data from the electronic health record system; this amounts to about 4% of all patients admitted to a GR ward.

The observed treatment intensity might be affected by improved time registration of treatment and may not be an increase in the actual treatment given. On the other hand, if the amount of treatment in 2015 were provided in 2007, this amount would not be accommodated by the fixed prices per day in 2007, which makes it unlikely that under registration can explain all of the observed increase of treatment intensity.

Because of the descriptive nature of the study, only a strong association but no causal relationship between ABF and the trends in treatment intensity or LOS could be established. The trend in the increase of treatment intensity was already visible in 2013 compared with 2007 but increased further in 2014–2015, whereas the LOS had not changed before the implementation of ABF. It must be noted that the inpatient mortality rate was lower in 2013 compared with 2007 before ABF was implemented. This may point to a possible anticipation of the announced implementation of ABF by selecting patients who are more likely to sustain high treatment intensities and return home after GR, thereby, altering the target population receiving GR. Unfortunately, we could not analyze whether a shift toward patients who are more fit has taken place during 2013–2015 because too little standardized functional measures were recorded in the electronic patient health record system to estimate the initial functional ability and functional gain during inpatient rehabilitation. Future research is needed to compare the current functional baseline characteristics of GR patients with those from the historical reference cohort of 2007 to establish a shift in allocating GR to patients with better clinical conditions.

Conclusions

After the institution of ABF in inpatient GR in The Netherlands, patients received higher intensities of treatment and had shorter LOS compared with 2007 and the year before implementation in 2013. During 2015, more patients returned to their home compared with a historical cohort from 2007. It remains unclear whether the observed decreased GR LOS and rate of patients returning home are related to changes in accessibility of GR. No nationwide data of functional outcome is available, which hampers the evaluation whether the initial functional status of patients has been changed during ABF implementation. The lack of reimbursement of patients with a high amount of comorbidity in the Dutch ABF system could hamper the accessibility of very frail patients to GR. Future research should focus on how ABF could be improved to create incentives to stimulate accessibility, functional outcome, and health-related quality of life besides treatment intensity and LOS of GR.

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References

1. Bachmann S, Finger C, Huss A, et al. Inpatient rehabilitation specifically designed for geriatric patients: systematic review and meta-analysis of randomised controlled trials. BMJ 2010;340:c1718.
2. Canadian Institute for Health Information (2013) The Why, the What and the How of Activity-Based Funding in Canada: A Resource for Health System Funders and Hospital Managers. Available at: https://secure.cihi.ca/free_products/ActivityBasedFundingManualEN-web_Nov2013.pdf. Accessed November 21, 2016.
3. Nederlandse Zorgautoriteit. Utrecth, The Netherlands. https://zorgproductenviewer.nza.nl/; Accessed November 21, 2016
4. Revalidatie in de AWBZ. Omvang, aard en intensiteit. ETC TANGRAM PHEG/LUMC Verpleeghuisgeneeskunde. March 31, 2008. https://www.vumc.nl/afdelingen-themas/69713/27797/tangram_RapportRevalidatieD1.pdf. Accessed November 21, 2016.
5. Palmer KS, Agoritsas T, Martin D, et al. Activity-based funding of hospitals and its impact on mortality, readmission, discharge destination, severity of illness, and volume of care: A systematic review and meta-analysis. PLoS One 2014;9:109975.
6. O'Brien S. Trends in Inpatient Rehabilitation stroke outcomes before and after advent of the prospective payment system: A systematic review. JNPT 2010;34:17–23.
7. Ottenbacher K, Smith P, Illig S, et al. Trends in length of stay, living setting, functional outcome, and mortality following medical rehabilitation. JAMA 2004;292:1687–1695.
8. Scrivener K, Jones T, Schurr K, et al. After-hours or weekend rehabilitation improves outcomes and increases physical activity but does not affect length of stay: A systematic review. J Physiother 2015;61:61–67.
9. English C, Shields N, Brusco N, et al. Additional weekend therapy may reduce length of rehabilitation stay after stroke: A meta-analysis of individual patient data. J Physiother 2016;62:124–129.
10. Rentsch H, Kaufmann T. Clearly defined goals at admission to the inpatient rehabilitation unit result in a relevant reduction of length of stay (LOS) for patients with stroke. Neurologie Rehabilitation 2008;14:254–264.
11. Meyer M, Britt E, McHale H, et al. Length of stay benchmarks for inpatient rehabilitation after stroke. Disabil Rehabil 2012;34:1077–1081.
12. Statistics Netherlands (CBS). Heerlen, The Netherlands. Available at: https://www.cbs.nl/nl-nl/onze-diensten/methoden/onderzoeksomschrijvingen/korte-onderzoeksbeschrijvingen/ziekenhuisopnamen. Accessed March 9, 2017.
13. Kroneman M, Boerma W, van den Berg M, et al. The Netherlands: Health system review. Health Syst Transition 2016;18:1–239.
14. Lohse K, Lang C, Boyd L. Is more better? Using metadata to explore dose–response relationships in stroke rehabilitation. Stroke 2014;45:2053–2058.
15. Nederlandse Zorgautoriteit. Utrecht, The Netherlands. Available at: http://www.opendisdata.nl/. Accessed November 21, 2016.

Appendix

Appendix 1

Trends in Treatment Intensity, LOS, and Mortality per Diagnosis Category

	Historical Cohort	Study Cohorts		
	Fixed Day Price		ABF	
	2007	2013	2014	2015
Treatment intensity				
Stroke, n	84	806	833	1256
Mean hours/week (SD)	4.4 (2.7)	5.0 (3.4)	5.8 (3.1)*	6.8 (5.8)*
Total joint replacement, n	28	569	683	1169
Mean hours/week (SD)	2.6 (1.6)	3.3 (2.0)	4.5 (3.1*	4.7 (2.6)*
Traumatic injury, n	96	1113	1380	2389
Mean hours/week (SD)	2.8 (1.8)	3.3 (2.6)	4.1 (2.6)*	4.4 (2.5)*
Other patients, n	91	1488	1927	3160
Mean hours/week (SD)	2.8 (1.8)	3.7 (2.7)†	4.7 (3.1)*	5.3 (3.4)*
LOS				
Stroke				
N	710	811	835	1257
Median (IQR)	55	57 (24–107)	49 (24–88)*	46 (26–78)*
Total joint replacement				
N	590	576	686	1170
Median (IQR)	30	30 (16–57)	26 (14–49)*	28 (16–51)
Traumatic injury				
N	746	1114	1384	2395
Median (IQR)	54	49 (26–84)	49 (27–78)	42 (26–67*
Amputation				
N	40	109	93	177
Median (IQR)	68	82 (35–151)	77 (37–124)	64 (35–108)
Miscellaneous diagnoses				
N	828	1384	1840	2992
Median (IQR)	48	45 (22–85)	38 (21–69)*	36 (20–61)*
Mortality during rehabilitation stay				
Stroke				
Total n	709	811	835	1257
Deceased, n (%)	104 (15)	45 (5.5)‡	58 (6.9)	97 (7.7)
Total joint replacement				
Total n	590	576	686	1170
Deceased, n (%)	9 (1.5)	4 (0.7)	6 (0.9)	11 (0.9)
Traumatic injury				
Total n	742	1114	1384	2395
Deceased, n (%)	40 (5.4)	48 (4.3)	51 (3.7)	84 (3.5)
Miscellaneous diagnoses, including patients with amputations				
Total n	868	1493	1933	3169
Deceased, n (%)	152 (18)	100 (6.7)‡	134 (6.9)	184 (5.8)

IQR, interquartile range; SD, standard deviation.

*Significant different compared with 2013 (Mann Whitney U test; $P < .02$).

†Significant different compared with 2007 (t test; $P < .02$).

‡Significant different compared with 2007 (χ^2 test; $P < .02$).

Appendix 2

Change in Discharge Destinations Between 2007 and 2015 for Each Rehabilitation Diagnosis

	Historical Cohort	Study Cohort
	Fixed Day Price	ABF
	2007	March 1, 2015– January 1, 2016
Outcome of inpatient rehabilitation registered, n (%)	2909 (100)	5536 (71)
Stroke patients, n (%)	709 (100)	898 (100)
Home (eg, original living place)	299 (42)	580 (65)
Permanent nursing home admission	133 (19)	154 (17)
Relocation to another inpatient geriatric rehabilitation location	33 (4.7)	5 (0.6)
Readmission to hospital	34 (4.8)	25 (2.8)
Other, including (private) residential care facilities	106 (15)	54 (6.0)
Deceased during inpatient stay	104 (15)	80 (8.9)
Total joint replacement, n (%)	590 (100)	728 (100)
Home (eg, original living place)	483 (82)	688 (95)
Permanent nursing home admission	16 (2.7)	9 (1.2)
Relocation to another inpatient geriatric rehabilitation location	9 (1.5)	1 (0.1)
Readmission to hospital	32 (5.4)	11 (1.5)
Other, including (private) residential care facilities	41 (6.9)	10 (1.4)
Deceased during inpatient stay	9 (1.5)	9 (1.2)
Traumatic injury, n (%)	742 (100)	1686 (100)
Home (eg, original living place)	489 (66)	1344 (80)
Permanent nursing home admission	53 (7.1)	166 (9.8)
Relocation to another inpatient geriatric rehabilitation location	4 (0.5)	10 (0.6)
Readmission to hospital	45 (6.1)	45 (2.7)
Other, including (private) residential care facilities	111 (15)	54 (3.2)
Deceased during inpatient stay	40 (5.4)	67 (4.0)
Miscellaneous diagnosis, n (%)	868 (100)	2224 (100)
Home (eg, original living place)	387 (45)	1596 (72)
Permanent nursing home admission	112 (13)	232 (10)
Relocation to another inpatient geriatric rehabilitation location	4 (0.5)	7 (0.3)
Readmission to hospital	96 (11)	135 (6.1)
Other, including (private) residential care facilities	117 (13)	101 (4.5)
Deceased during inpatient stay	152 (18)	153 (6.9)
Total group, n (%)	2909 (100)	5536 (100)
Home (eg, original living place)	1658 (57)	4208 (76)
Permanent nursing home admission	314 (11)	561 (10)
Relocation to another inpatient geriatric rehabilitation location	50 (1.7)	23 (0.4)
Readmission to hospital	207 (7.1)	216 (3.9)
Other, including (private) residential care facilities	375 (13)	219 (4.0)
Deceased during inpatient stay	305 (10)	309 (5.6)