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Swiss Diagnosis Related Groups: A prospective study in rehabilitation comparing outcome before and after its introduction into acute health care

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Summary

OBJECTIVE: To compare general health and the health-related quality of life of patients admitted to inpatient rehabilitation after a stay in an acute hospital before and after the introduction of Swiss Diagnosis Related Groups (SwissDRG).

METHODS: Consecutively referred patients with disorders of the lower extremities (LEX) or lumbar spine (LS) were evaluated by standardised outcome assessment instruments and for various co-factors. State (at entry to rehabilitation) and change of health (between entry and discharge from rehabilitation) were then compared between the cohorts before and after introduction of SwissDRG.

RESULTS: In LEX (n = 234), state of health, measured by the instruments' scores at entry, was not significantly different before and after SwissDRG, except for emotional role (worse state after SwissDRG, $p = 0.021$). These results were consistent for the LS group (n = 161). Change of health from entry to dismissal was comparable before and after DRG in the LEX group, whereas in the LS group, improvements after SwissDRG were significantly smaller in physical role ($p = 0.042$), bodily pain ($p = 0.012$) and physical component summary ($p = 0.009$) than before SwissDRG. Duration of stay in an acute hospital and duration of stay in the rehabilitation clinic were comparable before and after SwissDRG in both groups.

CONCLUSIONS: While state of health was comparable in both diagnostic groups, some dimensions in the LS group revealed lesser improvements after introduction of SwissDRG compared to before. In analogy to long-term observations after the introduction of DRG in Germany, it is possible that greater differences will also be identified in Switzerland by future studies.

Key words: *SwissDRG; fixed-price; rehabilitation; disease management*

Introduction

In 1967, the scientists Robert Barclay Fetter and John Devereaux Thompson at the University of Yale defined Diagnosis Related Groups (DRG) and then expanded their concept to establish a patient classification system. The refined solutions used today were first implemented after 1980 as a prospective accounting system in the Medicare programme in the USA [1]. Since then, DRGs have been introduced into a number of countries (Australia, Germany, France, Austria, Spain, The Netherlands, Norway, Finland, Japan, Canada and Great Britain) to determine funding and invoicing of hospital treatment.

Swiss Diagnosis Related Groups (SwissDRG) is the new tariff system for acute somatic inpatient hospital services and was introduced on 01/01/2012 [2]. According to the latest revision of the Health Insurance Act, the remuneration for inpatient hospital services is uniformly regulated throughout Switzerland by the DRG. Diagnosis Related Groups is a fee-regulating system whereby certain criteria such as principal diagnosis, secondary diagnoses, prescribed treatments and severity of the case are determined for each hospital stay, the relevant DRG is identified, and the insurance companies reimburse the hospital at a predetermined, set rate. In contrast to DRG, the fee-for-service system meant separate reimbursement for any and every health care service provided [3]. SwissDRG is supposed to provide transparency and comparability, and to improve efficiency and reduce costs [4].

A number of hypotheses related to the introduction of SwissDRG's have been formulated based on media reports and unsubstantiated prognoses from various sources [2], in particularly the fact that fixed pricing in Switzerland could provide a medical and economical incentive to discharge patients earlier than indicated from the acute care hospitals, some of whom will enter rehabilitation. Consequently, the state of health of patients admitted to rehabilitation might be worse after the introduction of SwissDRG than before. In other words, patients might be discharged prematurely from the acute hospital, before their condition is

adequately stable (so-called "raw" dismissals). Moreover, treatment may be more difficult and more demanding for both patients and therapists. This would mostly affect older patients who would then have to spend longer periods in rehabilitation.

Reports on international experience with DRGs in emergency and acute care over many years are available. The effects of German DRG on clinical rehabilitation in Germany, for example, were published recently [5]. However, the effects of SwissDRG on rehabilitation in Switzerland have not yet been investigated. The introduction of the Swiss tariff structure into rehabilitation ("ST Reha") is planned for the year 2016 at the earliest [6]. The findings from this study in terms of possible influences on the patients' general health or subsequent changes to infrastructure are of great importance because of the planned introduction of ST Reha, and as a basis for negotiations with different interest groups prior to introduction.

This study aimed to conduct a comparison of the general and specific state of health and co-factors of patients with musculoskeletal disorders of the lower extremities and the lumbar spine who were referred for in-patient rehabilitation in the time-period before and after the introduction of SwissDRG in acute somatic hospitals. Changes were recorded from start to finish of rehabilitation. The hypotheses were that after introduction of SwissDRG the patients would be older, their health poorer ("raw" dismissals), the duration of acute care hospitalisation would be shorter and that rehabilitation would take longer compared to before the introduction of SwissDRG.

Materials and methods

Study design and data sampling

In this longitudinal, single-centre, comparative cohort study all patients with musculoskeletal disorders of the lower extremities (LEX) and the lumbar spine (LS) who were referred from acute care facilities to the RehaClinic Bad Zurzach, Switzerland for in-patient treatment before (2009) and after introduction of SwissDRG (2012) were screened for possible inclusion into the study. The project was approved by the local ethics commission (EK AG 2008/026). The same selection procedures and inclusion criteria were applied in 2009 and in 2012. Patient participation was confirmed by informed consent. The data collection methods were slightly different in 2009 and in 2012. In the phase before introduction of DRG (2009), patient data were collected for global assessment of outcome at the RehaClinic Zurzach as part of routine, structured data collection for purposes of in-house quality assurance without focusing on specific questions related to DRGs. However, when the planned introduction of Swiss DRG became common knowledge the idea of the current study emerged with its focus on comparison of data before and after DRG and, consequently, the data sampling procedure was modified. Data collection became the responsibility of the management of the research department of the RehaClinic. In 2012, a standardised form was introduced that included categorisation into DRG and the health professionals collecting the data were informed that the present study would be conducted. Due to the knowledge and expectation of the future introduction of Swiss DRG in 2010 and 2011 (which might have influenced admission behaviours at the acute clinics as potential bias), the period of 2009 (i.e. prior to this knowledge) was chosen for comparison.

The inclusion criteria were as follows: Group LEX before SwissDRG consisted of all patients admitted with musculoskeletal disorders of the lower extremities (in most cases following hip/knee arthroplasty) throughout 2009 (January, 1st – December, 31st 2009). Group LEX after SwissDRG consisted of all patients admitted throughout 2012 (January, 1st – December, 31st 2012) with musculoskeletal disorders of the lower extremities (in most cases following hip/knee arthroplasty). Similarly, Group LS before SwissDRG included all patients admitted in the year 2009 with disorders of the LS (conservative and postoperative treatment). Group LS after SwissDRG consisted of all patients with LS disorders in 2012 (conservative and postoperative treatment).

The exclusion criteria were: Inability to fill out the questionnaire due to inadequate knowledge of the German language, cognitive deficits, lack of compliance (unwilling to participate in the study) as well as severe physical disability that prevented patients from participating in the therapies of the rehabilitation programme.

Outcome measures

In all four groups (LEX before and after DRG, LS before and after DRG), self assessment was performed by each participant according to international, standardised, validated questionnaires at entry to and dismissal from rehabilitation.

The Short Form-36 (SF-36) Health Survey evaluates general health-related quality of life based on 36 items in 8 dimensions: physical functioning, physical role, bodily pain, general health, vitality, social functioning, emotional role, mental health [7, 8]. Of these, four dimensions relate to physical health and four relate to subjective assessment of mental health. All scores are originally scaled from 0 (worst health) to 100 (best health).

The Western Ontario and MC-Master Universities Osteoarthritis (WOMAC) Index was specifically designed for the lower extremity and measures pain (5 items), stiffness (2 items) and physical functional ability (17 items) [9, 10]. The WOMAC is recommended as a primary, reliable and practicable assessment tool for all patients with degenerative joint disease at the hip and/or knee [9]. The patients enter their scores on a visual analogue scale (VAS) with a range of possible values from 0 (maximum pain/disability) to 10 (no pain/disability). The WOMAC scores were then transformed to the scale of 0 (maximum pain/disability) to 100 (no pain/disability) to be comparable to the SF-36 original scores. For clinical studies it is recommended that the WOMAC be supplemented by the SF-36 [10].

The North American Spine Society (NASS) lumbar measures pain/functional disability (11 items) as well as neurogenic symptoms (6 items) of back pain. The NASS questionnaire with the lumbar module is specific to back pain and is a disease-specific instrument for patients with pain in the region of the lumbar spine [11–13]. All items are scored on a six grade rating scale, whereby the lower scores in-

dicate slight pain and/or minimal functional disability. The NASS instrument is a disease-specific outcome instrument. It is therefore recommended that the NASS is used together with the instrument to measure general health, namely the SF-36 [12, 13].

Additional study parameters were obtained from the patient's file. The co-factors were age, sex, body mass index (BMI), number of co-morbidities (defined as active associated disorders, such as coronary heart disease, hypertension, diabetes mellitus, pulmonary embolism, thrombosis, cerebrovascular insult, orthopaedic disorders, etc), time-interval from operation to rehabilitation, and duration of the rehabilitation stay. Additionally, the date of surgery, interval between surgery and start of rehabilitation (time to transfer from the acute care facility to rehabilitation) were assessed in cases of surgical intervention.

Analysis

The aim was to collect data on a maximum number of study participants in order to achieve a minimum number of at least 50 in each of the four subgroups (LEX before and after DRG, LS before and after DRG). At least 50 patients (per subgroup to compare to another subgroup) allows the calculation of statistically significant differences (or smallest detectable difference, SDD) for a standard deviation (s) of 20 points (scale 0–100), which is a common standard deviation for study settings at our clinic [13]: SDD = $s(z\alpha+z\beta)/\sqrt{n/2}$. An SDD ≥11.3 score points (on a scale from 0–100) yields statistically significant differences given a type I error of 5% and a power of 80%, corresponding to a minimum effect size of 11.3/20 = 0.57 [14].

Analysis was performed using standard software (Excel database and the programme Dynelytics IBM SPSS Statistics 21.0). Instrument scores from before and after SwissDRG, stratified for LEX and LS were tested for statistical significance by one-way analysis of variance. This was performed for the scores at entry to the clinic as well as for the score-changes between entry and discharge. The level of significance was set at $p < 0.05$. In multiple testing within the same construct, correction of the significance level by (e.g.) the Bonferroni method may be appropriate [15]. For example, in the construct of pain in LS, the *p*-level of the 3 tests of SF-36 bodily pain, NASS pain and NASS pain and function had to be set at $p = 0.016$. However, in different constructs, for example those of the 8 scales of the SF-36, it would not make sense to use the Bonferroni correction. On the other hand, there may be other sources of possible bias which can result in false negative or in false positive significance, for example confounding co-factors that were not assessed.

The co-factors were compared by non-parametric tests across groups with and without fixed pricing. The Pearson-chi squared test was used for frequency data (e.g. number of excluded/included patients, sex, number of comorbidities) and the Wilcoxon rank sum test for the (quasi) continuous variables (e.g. the instruments' scores).

Possible co-factors for the length of the rehabilitation stay such as sex, age, BMI, and number of co-morbidities were tested by correlation analysis.

Results

The relevant inclusion data and socio-demographic and disease-related data are summarised in table 1. Data on a total of 395 patients (234 LEX; 161 LS) were available for analysis. Group LEX included 102 patients before SwissDRG (14.3%) out of 715 screened patients, 132 patients after SwissDRG (26.2%) out of 503 screened patients ($p < 0.001$), Group LS included 56 patients before SwissDRG (18.2%) out of 304 screened, and 105 patients after SwissDRG (43.8%) out of 240 screened patients ($p < 0.001$). The inclusion rate was significantly higher after SwissDRG than before SwissDRG for both diagnosis groups. The LEX cohort included 91.0% operated patients (hip/knee arthroplasty) and 9.0% of patients treated conservatively. The LS group contained 38.5% postoperative and 61.5% conservative cases. The percentage of women was higher than men in both diagnosis groups.

In the before-after SwissDRG comparison for the LEX and LS groups, there were no significant differences in terms of patient age, BMI, interval between surgery and start of rehabilitation, and rehabilitation duration. In contrast, patients before SwissDRG had significantly more co-morbidities than after SwissDRG in both diagnosis groups.

The entry scores derived from the SF-36 and WOMAC in the LEX group (table 2) were not significantly different for the before and after SwissDRG groups, except for SF-36 emotional role. On this scale, the group after SwissDRG reported greater difficulties at work or in activities in daily life, at work or at home due to emotional problems (mean = 67.4) than the group before SwissDRG (79.8, $p = 0.021$). Differences between entry and dismissal scores (positive difference = improvement) in the LEX group did not differ significantly in any dimension in the before-after SwissDRG comparison.

Patients with LS disorders were evaluated using the SF-36 and lumbar NASS (table 3). No significant changes were found in comparison of data collected before and after SwissDRG for any of the scores with the exception of SF-36 emotional role. On this scale, patients after SwissDRG reported more problems than patients before SwissDRG (means 48.9 versus 67.9, $p = 0.014$). LS patients showed significantly smaller and more moderate improvements between entry and discharge after SwissDRG than the group before SwissDRG in the following dimensions: physical role (difficulties at work or with other daily activities at work or at home due to physical health) (mean 17.9 before SwissDRG versus 5.0 after SwissDRG, $p = 0.042$), bodily pain (mean 18.7 before SwissDRG versus 9.8 after SwissDRG, $p = 0.012$) and the physical component summary (summarises all physical abilities) (mean 6.4 before SwissDRG versus 3.0 after SwissDRG, $p = 0.009$). A difference in the same direction was observed in the changes in SF-36 vitality ($p = 0.077$).

Rehabilitation duration was not different for men and women (table 1). Rehabilitation duration did not correlate with patient age, BMI or the number of co-morbidities in either of the diagnosis groups (all correlations according to the Pearson-chi squared test were <0.10). In the sub-analysis of potential confounders for the score differences (before and after SwissDRG), sex, age, BMI, numbers of co-morbid-

ities, time-interval from operation to rehabilitation, rehabilitation duration were examined and, no significant confounder was identified (data not shown in detail).

Discussion

The aim of this study was to compare the general health and quality of life of patients admitted to inpatient rehabilitation after a stay in an acute hospital before and after introduction of Swiss Disease Related Groups (SwissDRG) by application of validated assessment tools and investigation of co-factors.

On entry into rehabilitation, there were no apparent differences in general health or quality of life for patients with disorders of the lower extremity (in most cases status following total hip or knee replacement) or the LS, except for SF-36 scale emotional role. This finding means that the hypothesis of "raw" dismissals from the acute care facility could not be verified for this patient sample. Except for the SF-36 emotional role, the scores at entry to rehabilitation did not differ before and after DRG on the SF-36, the WOMAC and the NASS. Likewise, no differences were identified for the co-factors age, BMI, interval between surgery and start of rehabilitation, or the duration of in-patient rehabilitation. Therefore, the hypothesis of a shorter postoperative interval between surgery and start of rehabilitation after the introduction of SwissDRG fixed pricing could not be confirmed.

In our study, there was a tendency for patients to have significantly more co-morbidities before SwissDRG than after SwissDRG in both the diagnosis groups LEX and LS. This contradicts the perception of some clinicians that the cases referred after introduction of SwissDRG have become more complex. One reason for this result could be that the assessment of co-morbidities before DRG compared to after DRG was slightly different. In both years, identical co-morbidities were obtained from the medical records. However, in 2012 a standardised form was introduced for categorisation into DRG, which might have influenced reporting of co-morbidities in 2012 [16]. Smaller and more moderate improvements were identified on some scales (SF-36 physical role, SF-36 bodily pain, SF-36 physical component summary PCS) after the introduction of SwissDRG compared to before SwissDRG in the LS group. Although observed improvements cannot be completely causally related to therapy intensity (due to the non-

Table 1: Socio-demographic parameters and effects on the two diagnosis groups before and after SwissDRG[c].

	LEX[a]				LS[b]		
		before SwissDRG[c]	after SwissDRG[c]	before vs. after (*p*)[k]	before SwissDRG[c]	after SwissDRG[c]	before vs. after (*p*)[k]
Referrals screened	**n[d]**	**715**	**503**		**304**	**240**	
Inclusions	n[d] (%)	102 (14.3)	132 (26.2)	<0.001	56 (18.2)	105 (43.8)	<0.001
Women	% [e]	65.7	60.6	0.329	57.1	53.3	0.422
Age (y [j])	m[f] (s[g])	67.9 (12.2)	69.1 (12.0)	0.472	57.8 (15.6)	60.5 (16.3)	0.320
BMI[h] (kg/m²)	m[f] (s[g])	28.6 (5.7)	28.6 (5.5)	0.926	27.3 (4.9)	28.4 (6.1)	0.256
Time from OP to rehabilitation (d[i])	m[f] (s[g])	10.7 (4.8)	11.0 (9.8)	0.797	15.5 (14.7)	16.5 (18.9)	0.842
Rehabilitation duration(d[i])	m[f] (s[g])	20.6 (7.0)	19.9 (5.7)	0.389	20.3 (7.5)	20.6 (5.2)	0.721
Co-morbidities (n)	m[f] (s[g])	3.8 (2.3)	2.6 (1.6)	0.001	3.3 (2.6)	2.4 (1.4)	0.004

[a] LEX = lower extremities, [b] LS = lumbar spine, [c] SwissDRG = Swiss Diagnosis Related Groups, [d] n = number, [e] % percent, [f]m = mean, [g] s = standard deviation, [h] BMI = Body Mass Index, [i] d = days, [j] y = years, [k] *p* = significance: Chi square test for frequency data, Wilcoxon rank sum test for the (quasi) continuous variables.

Table 2: LEX[a] outcome und course.

	before SwissDRG[b] (n = 102)				after SwissDRG (n = 132)				before vs. after SwissDRG	
	Score at entry		Score change on dismissal		Score at entry		Score change on dismissal		Score at entry	Score change on dismissal
SF-36	**m[c]**	**(s[d])**	**m[c]**	**(s[d])**	**m[c]**	**(s[d])**	**m[c]**	**(s[d])**	**p[e]**	**p[e]**
Physical functioning	18.4	(17.8)	17.7	(17.5)	18.4	(19.7)	18.3	(20.6)	0.979	0.831
Physical role	3.4	(13.2)	10.5	(23.7)	6.6	(19.3)	4.6	(29.2)	0.152	0.097
Bodily pain	29.2	(23.5)	19.7	(23.1)	27.7	(20.7)	19.9	(24.2)	0.595	0.936
General health	59.7	(20.8)	6.4	(17.0)	64.4	(19.9)	3.0	(15.0)	0.082	0.103
Vitality	47.5	(23.9)	8.2	(21.2)	48.9	(24.9)	10.7	(21.3)	0.663	0.375
Social functioning	68.0	(32.5)	7.9	(29.7)	63.9	(30.3)	11.1	(31.0)	0.326	0.437
Emotional role	79.8	(36.1)	1.6	(37.6)	67.4	(43.3)	0.0	(55.9)	0.021	0.801
Mental health	70.1	(21.8)	8.2	(15.8)	70.9	(20.5)	7.1	(18.6)	0.768	0.652
Physical component summary	25.1	(7.1)	6.6	(6.6)	26.5	(7.4)	5.9	(8.4)	0.142	0.475
Mental component summary	55.9	(12.8)	32.2	(13.0)	53.9	(13.3)	29.4	(13.5)	0.265	0.114
WOMAC[g]										
Pain	55.4	(24.8)	19.4	(22.4)	58.0	(23.1)	18.7	(18.7)	0.416	0.793
Function	40.1	(20.5)	21.0	(17.5)	41.4	(20.0)	20.9	(17.5)	0.633	0.975

[a] LEX = lower extremities, [b] SwissDRG = Swiss Diagnosis Related Groups, [c] m = mean, [d] s = standard deviation, [e] *p* = significance, [f] SF-36 = Short Form-36 Health Survey, [g] WOMAC = Western Ontario und McMaster Universities Osteoarthritis Index
Scale: 0 = worst, 100 = best

randomised design of the study), this difference may be partly associated with lower rehabilitation potential of the patients after DRG compared to before DRG. In the LEX group no differences between entry and dismissal were found for the effects under observation in the before-after SwissDRG comparison.

These short-term findings are in partial agreement with the results of the German REhabilitation DIAgnosis-related-groups study (REDIA) [17, 18]. In the first phase, which was 1–4 years after the introduction of DRG, there was no reduction in the duration of rehabilitation within individual diagnosis groups (total hip, knee replacement) [17]. The interval between surgery and start of rehabilitation was not evaluated during this phase. In contrast, 5–8 years after introduction of DRG, the interval between surgery and start of rehabilitation as well as the in-patient rehabilitation stay were both significantly shorter [18]. General health, measured using the indicators of rehabilitation status (IRES) questionnaire, which has scales corresponding to those of the SF-36, showed no significant short or mid-term changes after the introduction of DRG in Germany [18]. In contrast, the specific function scores, the Staffelstein questionnaire for LEX and the Oswestry questionnaire for the LS showed no short-term changes, but long-term poorer function at the start and end of rehabilitation. In analogy to findings from long-term observation after the introduction of DRG in Germany, it is possible that greater differences in outcomes will also be measured in Switzerland by future studies.

Since the introduction of SwissDRG into the acute care hospitals, there has been an expectation of greater transparency in the treatment process and heightened economic efficiency coupled with genuine anxiety that cost-saving might lead to "raw" or premature dismissals. A first evaluation in hospitals without (i.e. fee-for service) and with SwissDRG showed no differences in the duration of acute hospitalisation consistent with our results [3]. In pulmonary and cardiac rehabilitation, there were no significant differences in duration of acute hospitalisation prior to rehabilitation nor in quality of life nor in the 6–minutes walking test [19]. The present study is the first in musculoskeletal rehabilitation in Switzerland to evaluate the effect of SwissDRG introduction on rehabilitation, after acute hospitalisation.

The most important limitation of the study was the low responder rate of patients referred for rehabilitation, which was significantly different before and after SwissDRG. This may have led to selection bias. The willingness of patients in the acute postoperative and acute rehabilitative phases to volunteer for participation was low, especially in 2009 before SwissDRG. After introduction of SwissDRG in 2012, it may have become higher through improved controlling of data collection by the in-house Research Department established at the study centre after the introduction of the DRG. The study examined various disease-relevant co-factors however, many others that were not assessed (e.g. psycho-social or socio-economic factors) may exist, which will influence outcome as important confounders. The non-randomised design limited the causal interpretation of similarities and differences between the two groups (before versus after DRG).

In summary, comparison of data collected before and after the introduction of SwissDRG showed comparable state of general health at entry to rehabilitation when measured by standardised self-assessments (exception: SF-36 emotional role). On dismissal from rehabilitation, change of health (difference to entry) was comparable in the LEX group, but in the LS group, improvements were smaller in 3 of 10 SF-36 scales in the period after introduction of SwissDRG. Treatment duration between operation and entry to rehabilitation as well as between entry and dismissal from rehabilitation were comparable in both diagnostic groups when comparing before to after SwissDRG. This is consistent with the experience in Germany. The duration of acute

Table 3: LS[a] outcome und course.

	before SwissDRG[b] (n = 56)				after SwissDRG[b] (n = 105)				before vs. after SwissDRG[b]	
	Score at entry		Score change on dismissal		Score at entry		Score change on dismissal		Score at entry	Score change on dismissal
SF-36[f]	**m[c]**	**(s[d])**	**m[c]**	**(s[d])**	**m[c]**	**(s[d])**	**m[c]**	**(s[d])**	***p*[e]**	***p*[e]**
Physical functioning	37.1	(25.8)	16.4	(18.6)	34.2	(22.6)	11.9	(18.8)	0.464	0.156
Physical role	12.5	(22.9)	17.9	(40.7)	10.0	(24.2)	5.0	(36.1)	0.525	0.042
Bodily pain	24.0	(20.2)	18.7	(19.3)	19.7	(19.0)	9.8	(22.1)	0.180	0.012
General health	55.1	(22.2)	3.7	(15.4)	54.2	(19.6)	3.3	(15.7)	0.791	0.888
Vitality	39.9	(21.7)	12.5	(18.4)	41.0	(25.2)	6.0	(23.6)	0.786	0.077
Social functioning	57.4	(28.5)	11.7	(34.4)	56.9	(30.3)	2.6	(32.8)	0.919	0.100
Emotional role	67.9	(44.5)	7.7	(37.1)	48.9	(46.9)	5.5	(50.5)	0.014	0.768
Mental health physical	64.4	(23.7)	8.2	(14.5)	58.0	(23.9)	8.2	(19.3)	0.110	0.993
Physical component summary	29.7	(8.5)	6.4	(8.7)	29.9	(8.2)	3.0	(7.3)	0.838	0.009
Mental component summary	48.6	(13.1)	21.9	(16.1)	45.0	(15.2)	17.5	(17.5)	0.137	0.119
NASS[g]										
Pain	20.9	(19.3)	21.1	(23.5)	20.8	(19.0)	14.9	(23.0)	0.967	0.108
Function	46.7	(19.4)	10.5	(14.5)	43.4	(16.0)	10.1	(14.9)	0.240	0.872
Pain&Function	41.5	(18.3)	12.6	(15.0)	38.8	(14.9)	11.1	(14.7)	0.312	0.529
Neurogenic symptoms	53.2	(30.9)	11.2	(19.3)	56.3	(24.5)	6.8	(19.6)	0.486	0.177

[a] LS = lumbar spine, [b] SwissDRG = Swiss Diagnosis Related Groups, [c] m = mean, [d] s = standard deviation, [e] *p* = significance, [f]SF-36: Short Form-36 Health Survey, [g] NASS lumbar = North American Spine Society questionnaire, lumbar module
Scale: 0 = worst, 100 = best

hospitalisation gradually became shorter and the physical disability at the start of rehabilitation became higher the longer the German DRG system was in place. After long-term use of German DRG, duration of stay in acute clinics as well as in rehabilitation clinics has decreased even though co-morbidities have become more frequent. For this reason, future long-term studies should be undertaken in Switzerland as well.

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