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# Functional Independence, Diagnostic Groups, Hospital Stay, and Modality of Payment in Three Croatian Seaside Inpatient Rehabilitation Centers

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**Aim** To determine patients' functional independence, diagnostic groups, duration of hospital stay, and modality of payment of rehabilitation in major special hospitals for rheumatology and medical rehabilitation on the Croatian seaside.

**Methods** In a cross-sectional study conducted from October 2006 until January 2009, we surveyed 400 patients treated at 3 special hospitals for medical rehabilitation. Their functional independence was assessed by modified Barthel index and they self-evaluated their health using the first item from the 36-Item Short-Form Health Survey questionnaire.

**Results** On admission, almost half of the patients (46%) were fully functionally independent, 33% were slightly dependent, while 21% were moderately or severely dependent. At the end of the hospitalization, significant predictors for the increase in Barthel index were longer hospital stay (odds ratio [OR], 1.14; 95% confidence interval [CI], 1.06-1.22), diagnosis of post-procedural musculoskeletal disorders (OR, 4.84; 95% CI, 1.90-10.57), diagnosis of conditions following acute ischemic heart disease (OR, 9.71; 95% CI, 3.40-27.75), and lower Barthel index at admission (OR, 0.96; 95% CI, 0.94-0.97). Of the 97 patients with dorsopathy, 73 (75%) were fully functionally independent and 57 (59%) paid for the treatment either themselves or contributed substantially to the total cost.

**Conclusion** Assessment of patients' functional status is important for the organization of inpatient rehabilitation. Patients with dorsopathy could be targeted as a population for medical tourism in rehabilitation medicine in order to maximize the use of rehabilitation hospitals.

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Rehabilitation medicine manages a person's functioning and health to minimize disability and symptoms (1). Important factors during rehabilitation are beneficial environmental factors and behaviors (1). Programs conducted in countries with warmer climates showed better results in improving physical function of patients with rheumatoid arthritis than those conducted in countries with colder climates (2). In addition, a 4-week coordinated rehabilitation program in patients with different neuromuscular diseases conducted in a warm climate has exerted positive long-term effects on different dimensions of health (3).

Due to its favorable geographic position in southeastern Europe, Croatia has the potential for developing rehabilitation medicine and health tourism programs. Current medical rehabilitation in Croatia is provided at outpatient and inpatient level through many ambulatory services and in teaching hospitals, as well as in 11 special hospitals for rheumatic diseases and/or medical rehabilitation (4-6). Most ambulatory services are provided through urban health centers (4). In 2006, 11 rehabilitation hospitals had the total capacity of 3437 hospital beds and 867 040 bed days, with annual bed occupancy of 253, and a bed utilization rate of 69.3% (6). Most of the expenses of rehabilitation are covered by the national health insurance program, managed by the Croatian Institute for Health Insurance (CIHI) (4,5,7). When deciding which services to cover, CIHI evaluates medical justification for inpatient rehabilitation based on the diseases, disease states, and consequences of injuries, as well as functional status measured by the Barthel index (7).

Over the next few years, due to the economic crisis we can expect a substantial decrease in the number of the beds contracted with CIHI in special hospitals (4,8), with the consequent increase in the relative proportion of patients who pay for part or all of the treatment themselves. Such a situation poses a challenge not only for the management of rehabilitation facilities but also for those who plan rehabilitation services in the health care system. In order to remain profitable in a competitive market, one would have to know which patient groups should be targeted by marketing activities, as well as how to adapt the existing facilities to achieve the best fit with the needs and demands of potential clients (9,10).

In order to provide useful data for rehabilitation service planning and for market segmentation, we aimed to determine patients' functional independence, diagnostic groups, hospital stay, and modality of rehabilitation payment in major special hospitals for rheumatology and medical rehabilitation at the Croatian coast. We assessed the baseline functional independence and its change during inpatient rehabilitation as a basis for planning the organization of treatment and services. We also explored the association of patient's diagnosis with the modality of payment and the level of functional independence.

## PARTICIPANTS AND METHODS

The present cross-sectional study was conducted at 3 special hospitals for inpatient medical rehabilitation in Croatia (Biokovka in Makarska, Kalos in Vela Luka, and Thalassoterapia-Opatija Special Hospital for Medical Rehabilitation, Diseases of the Heart and Lungs, and Rheumatism) (4,5) from October 2006 until January 2009. All 3 special hospitals are situated at the coast of Croatia, in an area with favorable climatic conditions, and offer services of physical medicine and rehabilitation. All the patients gave their informed consent and the study was approved by the hospitals' research ethics committees.

The sample included 400 patients consecutively admitted to the 3 institutions. At Kalos and Thalassoterapia, all newly admitted patients in 2008-2009 were invited to participate until we recruited 50 patients ≥65 years and 50 patients <65 years. At the Biokovka hospital, 100 patients were recruited in each of these age groups in 2006-2007. Most of the patients were admitted to rehabilitation during the subacute stage of a disease, and patients with chronic diseases were often admitted because of disease exacerbation (4,5).

We recorded standard demographic variables of each patient, diagnosis, duration of the hospital stay, and modality of payment. Payment options were the following: fully covered by the CIHI, partially covered by the CIHI ("co-payment"), or entirely covered by the patient ("self-payment").

Upon admittance to the hospital, the patients were classified into 6 diagnostic groups: group I, post-procedural musculoskeletal disorders, excluding fractures; group II, disorders following fracture and other musculoskeletal trauma; group III, conditions following acute ischemic heart disease (myocardial infarction, unstable angina), invasive interventions and surgical cardiovascular procedures; group IV, congenital or acquired peripheral and central palsy (stroke, flaccid paraparesis); group V, painful dorsopathies (intervertebral disc herniation and/or degenerative spine disease); and group VI, miscellaneous diagnoses with a small number of participants for each diagnosis, in-

cluding degenerative extravertebral arthritis (osteoarthritis), neurological disorders of unknown pathogenesis (multiple sclerosis, ataxia), inflammatory arthritis of unknown etiology (rheumatoid arthritis, ankylosing spondylitis), inflammatory connective tissue diseases (systemic lupus erythematosus, progressive systemic sclerosis), hereditary motor and sensory neuropathies, and congenital disorders of musculo-skeletal-joint system and myopathies.

Functional independence was assessed by the Barthel index, modified according to Shah et al (11,12), both at the beginning and at the end of the hospital stay. The assessment was performed by trained physiotherapists with a baccalaureate university degree and in consultation with physiatrists. The participants were divided into groups according to Barthel index score (13): 0-20 points, totally dependent; 21-60 points, severely dependent; 61-90 points, moderately dependent; 91-99 points, slightly dependent; and 100 points, fully independent.

In addition, patients self-assessed their health with the first item of the Medical Outcomes Study 36-Item Short-Form Health Survey questionnaire (SF-36, "In general, would you say your health is: excellent/very good/good/fair/poor") (14-16), both at the beginning and at the end of the rehabilitation.

### Statistical analyses

The data were presented as frequencies and were analyzed using Pearson $\chi^2$-test, with the α-level set at 0.05. Multivariate relationships between the change in Barthel index as a dependent variable and hospital stay, payment method, diagnostic groups, and Barthel index at the admission as predictors was tested using logistic regression analysis. The statistical analysis included 3 age groups: 18-44, 45-64, and ≥65 years. Due to the small number of severely dependent participants, the categories of severe and moderate dependence were combined for statistical analysis. In addition, the categories of co-payment and self-payment were combined during the analysis. All analyses were performed using SPSS for Windows, version 17.0 (SPSS Inc., Chicago, IL, USA).

## RESULTS

At the time the study was performed, 3 rehabilitation hospitals had the total capacity of 930 hospital beds, with 335 (36%) beds contracted by CIHI. Out of 400 recruited patients, approximately two thirds (62%) were women. There were 200 patients (50%) in the younger than 65 years age group, 59 (15%) in the 18-44 age group, and 141 (35%) in the 45-64 age group. Hospital stay expenses were fully covered by the CIHI for 292 (73%) patients and partially covered for 86 (21%) patients, while 22 (6%) patients paid all the expenses by themselves.

With regard to the admittance diagnosis, 326 (82%) patients belonged to diagnostic groups I-V, and these were included in the subsequent analyses. The most common diagnosis was post-procedural musculoskeletal disorders (excluding fractures), which were diagnosed in 112 (34%) patients; painful dorsopathies, which were diagnosed in 97 (30%)patients; disorders following fracture and other musculoskeletal trauma in 49 (15%) patients; conditions following acute ischemic heart disease (myocardial infarction, unstable angina) and invasive interventions and surgical cardiovascular procedures in 42 (13%) patients; and congenital or acquired peripheral and central palsy (eg, stroke, flaccid paraparesis) in 26 patients (8%).

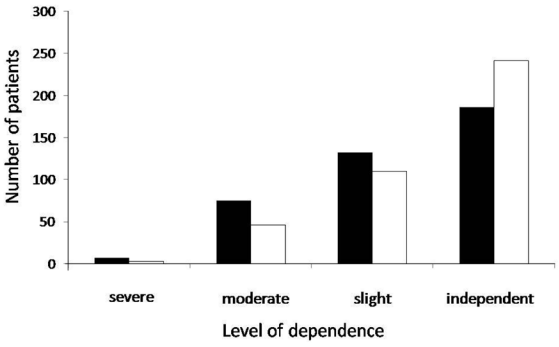
At the time of admission, 186 patients (46%) were functionally independent, 132 (33%) were slightly dependent, 75 (19%) were moderately dependent, and 7 (2%) were severely dependent. At the end of inpatient rehabilitation, 241 (60%) were functionally independent, 110 (27%) were slightly dependent, 46 (12%) were moderately dependent, and 3 patients (1%) were severely dependent (Figure 1). The Barthel index did not change during the stay at hospital for most of the patients (n = 249, 62%), whereas it improved for 143 (36%) patients. The median improvement was 5 points (95% confidence interval [CI], 4-6; range, 1-41). For a small number of patients (n = 8, 2%), Barthel index worsened by a median of 8 points (95% CI, -26.0 to -2.3; range, -2 to -28). For the entire patient sample, the median change in Barthel index was 0 (95% CI, 0-0), with a range from -28 to 28 points.

Functional independence was most likely to be improved in those patients who spent 3 or more weeks in treatment ($P < 0.001$) and the improvement could be expected in patients who recovered from musculoskeletal surgery and in those who had acute coronary syndrome or had undergone cardiovascular system interventions ($P < 0.001$) (Table 1). The state insurance covered the full cost of the patients who had a higher functional independence score at the end of the treatment ($P < 0.001$; Table 1).

Based on these bivariate relationships, we used logistic regression analysis to test multivariate relationships between

the change in Barthel index as a dependent variable (increase = 1; no change or decrease = 2) and hospital stay, payment method, diagnosis, and Barthel index at the admission as predictors. The model was significant ($P < 0.001$) and explained 38% of variance in Barthel index change (Nagelkerke $R^2 = 0.379$). Significant predictors for the increase in Barthel index were the diagnosis of post-procedural musculoskeletal disorders (odds ratio [OR], 4.84; 95% CI, 1.90-10.57) and the diagnosis of conditions following acute ischemic heart disease (OR, 9.71; 95% CI, 3.40-27.75), while longer hospital stay (OR, 1.14; 95% CI, 1.06-1.22) and lower Barthel index at admission (OR, 0.96; 95% CI, 0.94-0.97) were significant but clinically less relevant predictors.

Figure 1.




Functional independence at the beginning and at the end of inpatient rehabilitation (n = 400), according to the category of modified Barthel index. Closed bars – functional independence at the beginning; open bars – functional independence at the end.

As the distribution into functional independence categories at the beginning of inpatient rehabilitation was associated with the modality of payment and length of hospital stay (Table 2 and 3), we also explored the relationship between the modality of payment and the diagnostic groups. As shown in Table 4, state insurance most frequently covered the treatment of patients with post-procedural musculoskeletal disorders, those who had musculoskeletal trauma, and those with acute coronary syndrome and cardiovascular interventions ($P < 0.001$). Finally, the diagnoses were related to the functional independence at the be-

TABLE 1. Association of patient's age, duration of hospital stay, modality of copayment, and the most frequent diagnostic groups with the change of functional independence during inpatient rehabilitation

| Patient characteristics | Barthel index change, n (%) | | Total | Pearson $\chi^2$ test | *P* |
|---|---|---|---|---|---|
| | decrease or no change | increase | | | |
| Age (years): | | | | | |
| 18-44 | 39 (15) | 20 (14) | 59 | $\chi^2_2 = 0.35$ | 0.842 |
| 45-64 | 88 (34) | 53 (37) | 141 | | |
| ≥65 | 130 (51) | 70 (49) | 200 | | |
| total | 257 (100) | 143 (100) | 400 | | |
| Hospital stay (days): | | | | | |
| ≤10 | 46 (18) | 4 (3) | 50 | $\chi^2_2 = 23.28$ | <0.001 |
| 11-20 | 66 (26) | 30 (21) | 96 | | |
| ≥21 | 145 (56) | 109 (76) | 254 | | |
| total | 257 (100) | 143 (100) | 400 | | |
| Payment modality: | | | | | |
| payment by Croatian Institute for Health Insurance | 170 (66) | 122 (85) | 292 | $\chi^2_2 = 22.67$ | <0.001 |
| co-payment | 74 (29) | 12 (9) | 86 | | |
| self-payment | 13 (5) | 9 (6) | 22 | | |
| total | 257 (100) | 143 (100) | 400 | | |
| Diagnostic groups:* | | | | | |
| I | 58 (29) | 54 (44) | 112 | $\chi^2_4 = 45.79$ | <0.001 |
| II | 33 (16) | 16 (13) | 49 | | |
| III | 13 (6) | 29 (23) | 42 | | |
| IV | 15 (8) | 11 (9) | 26 | | |
| V | 83 (41) | 14 (11) | 97 | | |
| total | 202 (100) | 124 (100) | 326 | | |

*Diagnostic groups: I – post-procedural musculoskeletal disorders (excluding fractures); II – disorders following fracture and other musculoskeletal trauma; III – conditions following acute ischemic heart disease (myocardial infarction, unstable angina), invasive interventions and surgical cardiovascular procedures; IV – peripheral and central palsy, congenital or acquired; V – painful dorsopathies.

TABLE 2. Association of patient's functional independence at the beginning of rehabilitation and modality of payment for inpatient rehabilitation*

| Functional independence | Payment modality, n (%) | | |
|---|---|---|---|
| | payment by state insurance | co-payment or self-payment | Total |
| Severely or moderately dependent | 68 (23) | 14 (13) | 82 |
| Slightly dependent | 109 (37) | 23 (21) | 132 |
| Independent | 115 (40) | 71 (66) | 186 |
| Total | 292 (100) | 108 (100) | 400 |

*Pearson $\chi^2$ test, $\chi^2_2 = 22.02$, $P = 0.001$.

TABLE 3. Association of patient's functional independence at the beginning of rehabilitation and duration of hospital stay*

| Functional independence | Hospital stay (days), n (%) | | | |
|---|---|---|---|---|
| | ≤10 | 11-20 | ≥21 | Total |
| Severely or moderately dependent | 2 (4) | 10 (10) | 70 (27) | 82 |
| Slightly dependent | 4 (8) | 44 (46) | 84 (33) | 132 |
| Independent | 44 (88) | 42 (44) | 100 (40) | 186 |
| Total | 50 (100) | 96 (100) | 254(100) | 400 |

*Pearson $\chi^2$ test, $\chi^2_4 = 53.29$, $P < 0.001$.

TABLE 4. Association of patient's diagnostic groups and modality of payment for the inpatient rehabilitation*

| Diagnostic group† | Payment modality, n (%) | | |
|---|---|---|---|
| | payment by Croatian Institute for Health Insurance | co-payment or self-payment | Total |
| I | 99 (88) | 13 (12) | 112 (100) |
| II | 41 (84) | 8 (16) | 49 (100) |
| III | 42 (100) | 0 | 42 (100) |
| IV | 21 (81) | 5 (19) | 26 (100) |
| V | 40 (41) | 57 (59) | 97 (100) |
| Total | 243 (75) | 83 (25) | 326(100) |

*Pearson $\chi^2$ test, $\chi^2_4 = 85.04$, $P < 0.001$.
†Diagnostic groups: I – post-procedural musculoskeletal disorders (excluding fractures); II – disorders following fracture and other musculoskeletal trauma; III – conditions following acute ischemic heart disease (myocardial infarction, unstable angina), invasive interventions and surgical cardiovascular procedures; IV – peripheral and central palsy, congenital or acquired; V – painful dorsopathies.

ginning of inpatient rehabilitation (Table 5). The majority of patients with painful dorsopathies were independent, while most of the patients suffering from palsies or recovering from musculoskeletal trauma were moderately or severely dependent ($P < 0.001$). The change of the Barthel index in younger patients (18-44 age group) did not differ significantly from that in other age groups ($P = 0.842$; Table 1). Similarly, age was not associated with the class of functional independence at beginning of inpatient rehabilitation either ($P = 0.709$; Table 6). There was no association between the change of functional independence and self-perception of health ($P = 0.783$; Table 7).

TABLE 5. Association of patient's diagnostic groups and functional independence at the beginning of inpatient rehabilitation*

| Functional independence | Diagnostic groups, n (%)† | | | | | |
|---|---|---|---|---|---|---|
| | I | II | III | IV | V | Total |
| Severely or moderately dependent | 25(22) | 13 (26) | 7 (17) | 11 (43) | 7 (7) | 63 |
| Slightly dependent | 48(43) | 13 (27) | 27 (64) | 10 (38) | 17 (18) | 115 |
| Independent | 39(35) | 23 (47) | 8 (19) | 5 (19) | 73 (75) | 148 |
| Total | 112 (100) | 49(100) | 42(100) | 26(100) | 97 (100) | 326 |

*Pearson $\chi^2$ test, $\chi^2_8 = 70.28$, $P < 0.001$.
†Diagnostic groups: I – post-procedural musculoskeletal disorders (excluding fractures); II – disorders following fracture and other musculoskeletal trauma; III – conditions following acute ischemic heart disease (myocardial infarction, unstable angina), invasive interventions and surgical cardiovascular procedures; IV – peripheral and central palsy, congenital or acquired; V – painful dorsopathies.

TABLE 6. Association of patient's age and functional independence at the beginning of inpatient rehabilitation*

| Functional independence | Age group (years), n (%) | | | |
|---|---|---|---|---|
| | 18-44 | 45-64 | ≥65 | Total |
| Severely or moderately dependent | 11 (19) | 27 (19) | 44 (22) | 82 |
| Slightly dependent | 16 (27) | 49 (35) | 67 (33) | 132 |
| Independent | 32 (54) | 65 (46) | 89 (45) | 186 |
| Total | 59 (100) | 141 (100) | 200 (100) | 400 |

*Pearson $\chi^2$ test, $\chi^2_4 = 2.145$, $P = 0.709$.

TABLE 7. Association of patient's functional independence and self-perception of health

| Barthel index change | Change of self-perception of health, n (%) | | |
|---|---|---|---|
| | decrease or no change | increase | Total |
| Decrease or no change | 250 (98) | 7 (2) | 257 (100) |
| Increase | 139 (97) | 4 (3) | 143 (100) |
| Total | 389 (97) | 11 (3) | 400(100) |

*Pearson $\chi^2$ test, $\chi^2_1 = 0.076$, $P = 0.783$.

## DISCUSSION

Our study demonstrated that the information on functional independence at the beginning of inpatient rehabilitation provided a useful insight into organization of the rehabilitation treatments and services. First, we showed that a large portion of the participants had quite satisfactory functional status even at the beginning of the hospital stay,

as almost half of them were fully independent. This finding has important organizational and economical implications (17,18) because functionally independent patients require a different medical approach from patients with various levels of dependence (4). For example, not as many highly trained medical personnel are needed for their rehabilitation, and they might appreciate a different set of medical services, as well as a variety of leisure activities (2,3,8). In other words, the differentiation among groups of patients based on their baseline functional status provides an opportunity for the (re-)organization of health tourism programs along the coast into health-tourist facilities, which would be consistent with the existing Croatian health care regulation (7,19). The group of patients suffering from dorsopathies stands out with respect to the management of inpatient rehabilitation, as most of them (75%) were functionally fully independent already at the beginning of inpatient rehabilitation and more than half of them paid for the treatment either themselves or contributed substantially to the total cost. This identifies the patients with dorsopathies as the target population for medical tourism.

Our study identified some factors associated with the improvement of functional independence during the hospital stay, although not necessarily in a cause-and-effect fashion. Change of functional independence was significantly associated with the length of hospital stay, modality of payment, and diagnostic groups. The observed associations, particularly that with the length of the hospital stay and modality of payment, should be taken into consideration in economic and logistical planning of rehabilitation services (7,17,19).

The importance of the initial diagnosis for the change in functional independence was expected, since the Croatian regulations recognize the diagnosis as a key criterion for the referral of patients to the stationary treatment (7). In addition, the diagnostic categories were associated with the modality of payment and with the class of functional independence at the beginning of inpatient rehabilitation. Taken together, these data emphasize the relevance of diagnosis as an unavoidable input factor for the effective organization of medical rehabilitation.

The results of our study allow us to draw the conclusion that the national insurance works effectively (at least in this case), covering the costs for those patients who are most likely to benefit from the hospital stay. These are patients with post-procedural musculoskeletal disorders and patients with certain cardiac conditions, ie, the diagnostic groups showed significant improvement in functional independence during rehabilitation in our study.

According to the data from the beginning of medical rehabilitation, 66% of functionally independent patients paid for all or part of their treatment, whereas state insurance covered all costs for 40% of functionally independent patients. For the latter group, the Barthel index change is a less adequate measure of the rehabilitation program.

A relatively large proportion of participants (~25%) who paid for their treatment indicates the interest of the population for medical rehabilitation or rather their incentive to invest into their health. The existing interest of the population could also be seen from the fact that roughly two-thirds of the beds in the study hospitals were not contracted by state insurance (4,7,8). Those beds are, therefore, on the open market and we believe that the data presented here may be useful in planning management activities to maximize the utilization of those capacities.

Several variables in our study showed no relation with the functional status of the patients. First, the age of participants was not related to the functional improvement at the end of the treatment. This was reinforced by the observation that age was not associated with the baseline functional independence before therapy. Both findings contradict the usual perception of functional impairment of elderly clients in stationary rehabilitation (5). The fact that elderly clients were not functionally challenged should be discussed in conjunction with recent research showing an increasing interest of elderly population for medical-tourist services and with the well-known observation that the European population is getting older (20). Thus, it could be predicted that the demand of senior citizens for the inpatient rehabilitation will continue to grow. We argue that the way to meet this demand is to include adequately equipped and staffed tourist facilities into the array of packages offered by health-tourist providers. The services offered should be aimed at the promotion of functional ability of senior citizens and promotion of healthy aging (21-23).

Our study also showed that the patients who improved functionally during the hospital stay did not significantly perceive their health as better, implying that they did not think of their functional status as an important determinant of their health. This finding contradicts several previous studies showing a close link between subjective perception of health and functional independence

(24-26). A plausible explanation is that, although functional independence is closely related to perception of health, it is just one of the contributing factors, such as age, sex, and presence or absence of pain (26-29). As the self-assessment of health was evaluated by a single item of the SF-36 questionnaire, it is possible that such crude evaluation of participant health caused the lack of association of functional independence and health. Also, we evaluated only general health (16,29), thus neglecting the possible impact of functional independence on mental health.

The evaluation of functional independence of patients was made using Barthel index, which is frequently used in rehabilitation medicine and has been tested in patients with various chronic diseases (30-34). Barthel index is a relatively simple questionnaire routinely used by professional staff in rehabilitation medicine, and also used by the CIHI for the assessment of the functional status at admission to inpatient rehabilitation (7,35). Many studies demonstrated its reliability (35). However, it may not detect low levels of disability and does not assess other needs, such as the need for assistance with other daily living activities (36). Nevertheless, the Barthel index has been shown to be reasonably reliable using assessment procedures similar to those in our study (35). Another limitation of the study is the fact that the patients were evaluated by different raters, which could result in inter-rater bias..Our study focused on only 3 out of 11 special hospitals for medical rehabilitation in Croatia selected based on their location at the coast, ie, in the region with beneficial climate. Those hospitals would be good candidates for medical tourism, which could improve their profile and would give them a marketing advantage (37-40). However, as this choice could have introduced a selection bias, our data should be generalized with due caution. Finally, even though only 36% of the beds in our study hospitals are contracted by CIHI, 73% of our patients had all their hospitalization costs covered by state insurance. A possible explanation could be that we performed the examination in the period in which the hospitals were able to accept this type of patients, due to their budgetary limit for contracted beds. It would be interesting to see whether similar results are obtained when the majority of patients pay for all or part of their treatment expenses. In spite of the limitations, we believe that the results of the present study are an important contribution to the process of harmonization of medical services offers and the potential consumers' requests (9,10,41), which is an issue particularly relevant for transition countries (4). Our data point to the necessity to strictly define the standards for inpatient rehabilitation and to enable the provision of medical rehabilitation for selected patient groups, such as those without or with slight functional disability, by adequately adapting the existing tourist facilities. Such reorganization would be a highly welcome addition to the local economy and would enable special hospitals to focus on those patients who need a higher level of medical attention and to ensure a better service for them.

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