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Rehabilitation benefits highly motivated patients: A six-year prospective cost-effectiveness study

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Objectives: To compare the six-year outcome of a multidisciplinary rehabilitation program with continued care within primary care in terms of health-related quality of life and cost-effectiveness. Furthermore, predictors of total costs to society were examined.
Methods: A prospective, matched, controlled, six-year follow-up was designed. The study included 236 patients (42 men, 194 women) nineteen to sixty-one years of age with prolonged musculoskeletal disorders. The intervention comprised a four-week multidisciplinary rehabilitation and an active one-year follow-up based on a bio-psycho-social approach. The control group received continued care within primary care. The main outcome measures were quality of life measured using the Nottingham Health Profile, motivation identified by an interview and patient-specific total costs to society. Differences in mean costs between groups and cost-effectiveness were evaluated by applying nonparametric bootstrapping techniques.
Results: Total costs per treated patient in the rehabilitation group and the control group were £43,464 (SD = 31,093) and £44,123 (SD = 33,333), respectively ($p = .896$). Multidisciplinary rehabilitation improved quality of life somewhat more cost-effectively. Motivation was revealed as a predictor of total costs.
Conclusion: In the long-run, the evaluated multidisciplinary rehabilitation improved the highly motivated patients' quality of life most cost-effectively. The latently motivated patients may require rehabilitation, which is less intensive and with a longer duration, to improve their health in a whole-person perspective. The burden of prolonged musculoskeletal disorders to society was reaffirmed. Motivation could be a predictor of total costs, a factor which has to be taken into account in the examination procedure.

Keywords: Musculoskeletal diseases, Motivation, Quality of life, Primary care, Cost-effectiveness analysis

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Prolonged musculoskeletal disorders, that is, with a duration of more than six months (15;28), are a major cause of ill health and economic loss in the developed countries and represent a challenge for the health-care and insurance systems (15;19;28). Patients with prolonged musculoskeletal disorders contribute significantly to the work load in primary care (4;20). Sickness certifications are the specific measure that causes the greatest expense to society and certifications due to musculoskeletal disorders have increased exponentially (20;27). Pressure has been imposed by government authorities to reduce the cost of sickness absence. Substantial attention has focused on rehabilitation efforts designed to improve working ability (24). The process of giving the patient's behavior its energy and direction is related to motivation (21). To improve the re-employment rate among long-term sick-listed patients with musculoskeletal disorders, the importance of dealing with their total situation within comprehensive multidisciplinary program has been emphasized (5;10;11).

It has been shown previously that prolonged musculoskeletal disorders have a multidimensional impact on patients, while their health-related quality of life is considerably reduced (2;10). Quality of life is used nowadays when evaluating clinical treatments and as an end point in clinical trials (23), and it needs to be incorporated in the economic evaluations of these investigations (6).

The aim of estimating costs is not simply to calculate the economic resources that have been consumed because of disorders. From society's viewpoint, it is necessary to evaluate costs to enable the efficient utilization and allocation of resources (6;18;26), which, on the other hand, are influenced by social preferences and the ethical values of society (6).

Hitherto, long-term patient-specific economic evaluations of rehabilitation efforts incorporating health-related quality of life in patients with prolonged musculoskeletal disorders are rare. A previous two-year follow-up study of patients with these disorders indicated that multidisciplinary rehabilitation improved quality of life more cost-effectively than continued treatment within primary care. Furthermore, the study showed that motivation could influence the total cost to society, thereby underlining the importance of taking into account the interaction between patients and the health-care system (10).

This prospective, controlled study aimed to investigate the six-year outcome of a multidisciplinary rehabilitation program in terms of health-related quality of life and cost-effectiveness. Furthermore, predictors of the total cost to society were examined.

SUBJECTS AND METHODS

Patients

During the period January 1994 to June 1995, all the patients referred consecutively to the Kronoberg Occupational Rehabilitation Centre who fulfilled the criteria were invited to participate. The inclusion criteria were problems with long and/or repeated short periods of sick leave during the past year for musculoskeletal disorders (ICD 9th revision, diagnoses M 47, 50-54, 75, 79, and F 45). The exclusion criteria were disability pension, substance abuse, mental illness, pregnancy, or being a non-Swedish speaker. In all, 129 patients were invited to participate and 122 agreed. A matched control group was identified by the Social Insurance Office, taking account of musculoskeletal disorder, gender, age, cultural background, employment/unemployment, and the extent of sick leave. The invitation was accepted by 114 patients. The baseline data are summarized in Table 1.

At the six-year follow-up, 104 (85%) of the patients in the rehabilitation group and 90 (79%) in the control group participated. However, twenty-two patients in the rehabilitation group and nine patients in the control group had not completed the rehabilitation diary. Accordingly, the economic evaluation comprised eighty-two and eighty-one patients in the rehabilitation group and the control group, respectively. There were no significant differences in sociodemographic data between these patients and the original groups.

Concept of Motivation

Motivation can be defined as everything that drives and sustains human behavior (21). The theory in this study emanated from Maslow's hierarchy of needs (18). The development of the concept incorporated cognitions and emotions (21). Cognitions relate to goal-setting motivation, while emotions energize and direct behavior as well (21). The model took into account the patients' work situation and social and professional networks (18;30). The model also included the individual's line of reasoning in terms of coping skills (25).

Motivation Analysis

At baseline, patients took part in a written interview designed to define their motivation for change. The original interview was designed by a physiotherapist (22) and has been additionally improved for today's health care (10;22). Patients were regarded as highly motivated if they presented goals, their own possible efforts, and necessary support from others. Patients who had difficulty presenting goals and who expected medical care to reduce most of their problems or could only see impediments were regarded as latently motivated. A simple inter-rater test revealed more than 85% agreement (10).

INTERVENTIONS

Multidisciplinary Rehabilitation

The four-week multidisciplinary program was designed to benefit the patients' health-related quality of life and facilitate their return to work (10). The approach was bio-psycho-social (5) and focused on Basic Body Awareness Therapy, that is, identity activating and focusing on the interaction between mental awareness and psychomotor functions (17;22) and

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Table 1. Demographic Data and Baseline Characteristics of Patients in the Rehabilitation Group and in the Control Group

	Rehabilitation group ($n = 122$)				Control group ($n = 114$)				
	n	%	Mean	SD	n	%	Mean	SD	*p*
Female	100	82.0			94	82.5			.922
Age (yr)			44.3	9.1			44.8	9.2	.662
Civil status									
Married/cohabiting	97	79.5			88	77.2			.449
Cultural background Swedish	103	84.4			99	86.8			.829
Education									
9-year compulsory school only	81	66.4			72	63.2			.065
Socioeconomic classification									
Nonprofessional workers	85	69.7			83	72.8			.332
Employed/self-employed (yes)	98	80.3			95	83.3			.550
Annual income including employers' costs, £[a]			14,095.5	3,517.7			14,776.6	4,065.7	.169
Motivation for change									.954
Highly motivated	36	30.0			24	30.4			
Latently motivated	84	70.0			55	69.6			
Disorders related to									.892
Cervical spine-shoulder	44	36.1			37	32.5			
Arm	12	9.8			9	7.9			
Cervical and lumbar spine	12	9.8			15	13.2			
Lumbar spine and/or leg	32	26.2			31	27.2			
General ache syndrome	22	18.0			22	19.3			
Quality of life (NHP, global score)			39.3	15.6			36.3	17.9	.248
Pain related to movements (VAS)			45.5	24.3			43.6	24.6	.557
Time since onset (yr)			5.7	6.1			5.6	5.5	.916
Sick leave at baseline									.065
No sick leave	23	18.9			16	14.0			
Partial sick leave	30	24.6			44	38.6			
Total sick leave	69	56.6			54	47.4			
Working days lost six months prior to the study			105.7	63.6			125.3	45.9	.051

[a] £1.00 = SEK 14.87 (2001).
NHP, Nottingham Health Profile.

cognitive and relaxation treatment. The patients were actively involved in the formulation of goals for their rehabilitation. The total scheduled treatment time was 131 hours. During the active one-year follow-up period, at least three follow-ups, at which further advice was given, were scheduled.

Continued Care Provided by Primary Care

Patients in the control group were followed up by their general practitioners' treatments, first and foremost physiotherapy. During the intervention period (1994–96), Basic Body Awareness Therapy was not available within primary care in the county. The rehabilitation program and the standard treatment have previously been presented (10). The patients in both groups had full access to health care during the six-year follow-up.

PRIMARY OUTCOME MEASURES

Health-Related Quality of Life

Quality of life was evaluated using the Nottingham Health Profile (NHP), a generic questionnaire created to estimate significant dimensions influenced by disease (29). Responses in part 1 relate to emotional reactions, sleep, energy, pain, physical mobility, and social isolation and result in a scale of 0 = absence of all problems to 100 = maximum problems. From the values for the six areas, a mean value (that is, global score) was calculated (29).

Direct Costs

Direct costs related to musculoskeletal disorders during the follow-up have been estimated from rehabilitation diaries completed by the patients (10) and from the patients' medical files. The costs were estimated from the unit costs of health care confirmed by the cooperation committee of the southern region of the medical service in Sweden in 2001. The relevant patient-specific health service costs are listed in Table 2. The unit cost included all operating and attendant expenses and wage payments associated with the treatment occasion (10). The intervention cost for the rehabilitation group also included the cost of the investigation (10). The Social Insurance Office costs covered staff costs, including employers' social security contributions and attendant costs (10).

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Table 2. Total Direct and Indirect Costs Due to Muskuloskeletal Disorders in the Rehabilitation Group and the Control Group (in British Pounds[a]): A Six-Year Follow-up

	Rehabilitation group ($n = 82$)				Control group ($n = 81$)					
	Mean	SD	Mean cost per patient	SD	Mean	SD	Mean cost per patient	SD	Mean (95% CI) Diff[b]	p[c]
Multidisciplinary rehabilitation at Kronoberg Occupational Rehabilitation Service, unit cost £188/day	24.0	0.0	4,544	28	0.0	0.0	0	0	4,544 (4,538 to 4,550)	0.000
Primary health care, in total	70.1	70.3	1,242	989	52.1	53.7	1,067	951	175 (−126 to 475)	0.253
General practitioner, £45	10.8	8.8	486	397	10.2	8.6	456	387	30 (−91 to 151)	0.478
Physiotherapy, individual, £17.5	21.0	23.6	368	413	25.2	31.5	440	551	−72 (−222 to 78)	0.348
Physiotherapy, group session, £10	38.0	59.2	386	601	16.3	30.4	164	308	222 (73 to 370)	0.004
Occupational therapy, individual, £17.5	0.1	0.6	2	10	0.4	2.1	7	36	−5 (−13 to 2)	0.188
Open specialist care, £18–536/visit X-ray, specialist doctors, psychological and/or psychosocial therapy	7.0	7.8	592	782	8.3	9.0	732	846	−140 (−393 to 111)	0.271
Additional multidisciplinary rehabilitation, £86–188/day	3.5	9.6	379	1,100	7.0	11.6	1,089	1,871	−710 (−1,188 to −235)	0.004
Institutional care, £161–4,210/visit Orthopedic operations, inpatient care	1.3	6.3	393	1,599	2.2	10.0	761	2,348	−368 (− 992 to 253)	0.243
Regional Social Insurance Office, visit £20/hour	8.0	8.9	215	261	8.7	10.5	243	304	−28 (−116 to 59)	0.525
Total direct costs			7,365	2,706			3,892	3,945	3,473 (2,425 to 4,522)	0.000
Total indirect costs[d]	934.6	721.2	36,099	30,258	1026.0	759.3	40,231	32,248	−4,132 (−13,804 to 5,539)	0.407
Total costs			43,464	31,093			44,123	33,333	−659 (−10,628 to 9,311)	0.896

[a] £1.00 = SEK 14.87 (2001).
[b] Negative cost differences indicate cost savings in favor of the rehabilitation group.
[c] Significance calculations have been made for the monetary measures.
[d] Mean value indicates total days of production lost during the six-year follow-up.

Indirect Costs

Indirect costs arising from sick leave were estimated according to the human capital approach (6). Information relating to patient-specific lost production six months before the study and during the six-year follow-up was supplied by the patients and the Social Insurance Office, together with the patients' annual income. Partial working days lost have been computed into whole days. The patient-specific indirect costs were estimated using whole working days lost within six-month follow-up periods (income including employers' costs/lost working day).

Economic Evaluation

An economic evaluation according to the cost-effectiveness model was performed (6). The cost analyses were undertaken from the perspective of society, including direct and indirect costs. The estimation of total costs was based on Swedish prices in 2001 and was converted to British pounds (£) at the mean 2001 exchange rate (£1.00 = SEK 14.87) approved by the Bank of Sweden. The cost-effectiveness ratio was calculated by dividing the difference between the mean total costs of the two interventions by the difference in the global NHP score outcomes (baseline compared with six-year follow-up) of the two interventions. Sensitivity analyses were performed by comparing benefits with total costs, with zero, three, and five percent discounting rates, respectively. Confidence intervals for the cost-effectiveness ratios were obtained by bias-corrected bootstrapping (6), choosing five million as the number of replications. Cost-effectiveness ratios were plotted on cost-effectiveness planes (6).

Statistical Methods

The analyses were made on an intention-to-treat basis. Proportions were compared using the chi-square test. The t-test was applied when groups were compared in terms of continuous variables, provided that they were normally distributed. Wilcoxon's rank-sum test was applied to other continuous and ordinal variables. Accordingly, the paired t-test or Wilcoxon's signed rank test was applied to compare baseline data with six-year follow-up data within the groups. A significance level of $p < .05$ was chosen. To analyze the effects of potential predictors on the dependent variable total costs, multiple linear regression was used. Predictors were selected from sociodemographic, quality of life,

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phychosomatic, physical and working environment factors (7;10). First, the effect of each predictor was estimated using the one-way analysis of variance technique for the categorical predictors and the simple linear regression technique for the other predictors. Second, the predictors that displayed a clear tendency to affect the dependent variable ($p < .10$) were forwarded in a stepwise multiple linear regression procedure with $p < .05$ as the inclusion criterion and $p < .10$ as the removal (of already included predictors) criterion. Model assumptions were checked by means of residual analysis (1).

RESULTS

Intervention and Cost Outcome

The rehabilitation group had produced significantly higher direct costs compared with the control group. The utilization of health care took place mainly within primary care (Table 2). Within the rehabilitation group, 24 (29%) of the patients worked full time, 28 (34%) worked part time, and 29 (36%) were on total sick leave, while the corresponding figures for the control group were 24 (30%), 29 (36%), and 25 (31%), respectively ($p = .676$). One subject in the rehabilitation group and three in the control group had reached retirement age, 65 years. There was no difference between the groups in terms of the indirect costs or total costs (Table 2). When the global NHP score mean difference values recorded within the groups were compared, a tendency toward improvement in favour of the rehabilitation group was found ($p = .089$; Table 3). Cost-effectiveness ratios and corresponding confidence intervals are presented in Table 3. The cost-effectiveness plane indicated that the quadrant representing improvement and less expense in favor of the rehabilitation group was the largest (Figure 1a).

Motivation as a Predictor of Costs

A multiple regression analysis was performed to reveal predictors of total costs over a six-year period. In the model ($n = 163$), R^2 (adjusted) = 44% of the variance was explained by nine variables: motivation, sick leave history, income, gender, problems with social life, employment/self-employment, age, body image, and pain related to movements. There was a significant difference in the direct costs of the highly motivated patients in the rehabilitation group ($n = 29$) and the control group ($n = 21$): £7,116 (SD = 2,340) and £2,936 (SD = 2,637), respectively ($p < .000$). When it came to indirect costs, there was a significant improvement in favor of the rehabilitation group within the period eighteen to twenty-four months after baseline ($p = .038$) and a tendency within the periods twenty-four to thirty and thirty to thirty-six months ($p = .059$) and ($p = .093$), respectively. However, there was no difference in the total savings per patient in terms of indirect costs during the study between the rehabilitation group, £25,869 (SD = 30,357), and the control group, £25,571 (SD = 25,253; $p = .878$).

Among the latently motivated patients, there was a significant difference in direct costs between the rehabilitation group ($n = 52$) and the control group ($n = 42$): £7,547 (SD = 2,909) and £4,066 (SD = 3,166), respectively ($p < .000$). When it came to indirect costs, there were no differences between the groups during the follow-up period. However, when it came to total savings per patient in terms of indirect costs, there was a significant difference between the

Table 3. Comparison of the Rehabilitation Group and the Control Group in Terms of Total Costs (£)[a] and Improvements in Health-Related Quality of Life at the Six-Year Follow-up

	Rehabilitation group					Control group					
	Costs per patient[a]			Effects[b]		Costs per patient[a]			Effects[b]		
	n	Mean	SD	Mean	SD	n	Mean	SD	Mean	SD	Ratio (95% CI)[c]
All patients included											
No discounting	82	43,464	31,093	9.4	16.3	81	44,123	33,333	6.3	19.4	RG[d]–215 (−12,296; 12,093)
3% discounting	82	38,969	28,213	9.4	16.3	81	39,820	30,124	6.3	19.4	RG–278 (−11,180; 10,826)
5% discounting	82	36,358	26,523	9.4	16.3	81	37,295	28,239	6.3	19.4	RG–306 (−10,537; 10,072)
Highly motivated patients											
No discounting	29	26,562	19,889	12.0	19.5	21	28,070	24,531	1.0	18.6	RG–137 (−1,855; 2,688)
3% discounting	29	23,655	18,138	12.0	19.5	21	25,247	22,112	1.0	18.6	RG–145 (−1,703; 2,363)
5% discounting	29	21,975	17,112	12.0	19.5	21	23,598	20,706	1.0	18.6	RG–148 (−1,611; 2,182)
Latently motivated patients											
No discounting	52	53,587	32,027	7.6	14.1	42	50,846	35,335	7.9	21.0	CG[e]–9,168 (−33,693; 15,428)
3% discounting	52	48,142	29,039	7.6	14.1	42	45,838	31,985	7.9	21.0	CG–7,705 (−29,691; 14,391)
5% discounting	52	44,973	27,285	7.6	14.1	42	42,904	30,019	7.9	21.0	CG–6,921 (−27,443; 13,719)

[a] £1.00 = SEK 14.87 (2001).
[b] Effects = improvement from baseline in healthrelated quality of life, measured by Nottingham Health Profile global mean score (standard deviation). A higher score indicates a more favorable outcome.
[c] 95% CI = 95% confidence interval. The 95% CIs were obtained by bias-corrected bootstrapping, choosing five million as the number of replications.
CG, control group; RG, rehabilitation group.

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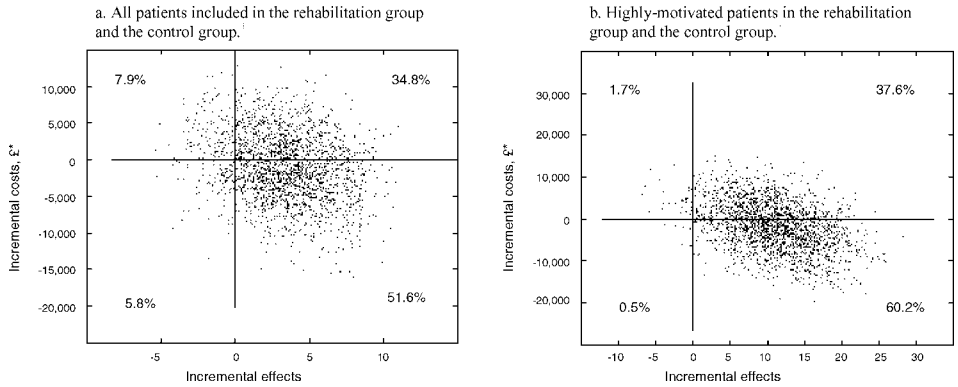

Figure 1. Cost-effectiveness plane for the rehabilitation group compared with the control group for health-related quality of life, measured by the Nottingham Health Profile global score, with incremental three percent discounted costs/effect pairs distribution. The figures show 2,000 of the five million replications obtained in each model by bias-corrected bootstrapping. Asterisks indicate £1.00 = SEK 14.87 (2001). The percentages show the distribution between the northeast quadrant (improvement and more expensive), the southeast quadrant (improvement and less expensive), the southwest quadrant (deterioration and less expensive), and the northwest quadrant (deterioration and more expensive).

rehabilitation group, £2,050 (SD = 27,180), and the control group, £14,970 (SD = 29,709; $p = .038$).

A significant improvement in favor of the rehabilitation group, in terms of the global NHP score mean difference value, was found among the highly motivated patients ($p = .022$; Table 3). Among the latently motivated patients, no such difference was found ($p = .735$; Table 3). In terms of the highly motivated patients, the rehabilitation group improved its global score most cost-effectively (Table 3; Figure 1b). Whereas, among the latently motivated patients, the control group improved its global score more cost-effectively (Table 3).

DISCUSSION

This study provides unique prospective, patient-specific, six-year follow-up data on the management, outcome, and costs of prolonged musculoskeletal disorders in a societal perspective. The patients receiving multidisciplinary rehabilitation improved their health-related quality of life slightly more cost-effectively. Motivation was shown to be a predictor of total costs in a prolonged time perspective, and this finding highlights the significance of taking account of the interaction process between the patient and the health care personnel.

The intervention part of the study was undertaken during a period of extensive unemployment in Sweden (10). Characteristics of the follow-up period were far-reaching changes on the labor market (10) and heavy demands on the social insurance system to improve the re-employment rate (16).

The study reaffirms the burden of prolonged musculoskeletal disorders to society (20;27), which accentuates the need for economic evaluations. To our knowledge, prospective long-term follow-ups of patient-specific total costs in relation to changes in quality of life are rare in these disorders. A small number of studies comparing the effectiveness of extensive multidisciplinary rehabilitation with light multidisciplinary interventions on the one hand (8;24) and an operant program (9) or treatment as usual (24) and waiting list condition (8;9) on the other have been presented. However, at most, these studies had a three-year follow-up period.

The difference between the direct costs in the rehabilitation group and the control group was mainly explained by the cost of the multidisciplinary rehabilitation. However, the program failed to reduce the rehabilitation group's demand for further health care. Most of the medical measures took place within primary care. More evidence is needed from primary care about the management of musculoskeletal disorders, because this treatment level largely determines the total costs in the long-term perspective (20).

The benefit of the bio-psycho-social approach to prolonged musculoskeletal disorders has been emphasized (3;5;21). The patients in the rehabilitation group improved their quality of life to a somewhat greater extent and, as the improvement was similar to that at the two-year follow-up (10), this improvement indicated some degree of credibility. The clinical relevance of this improvement in relation to additional costs could be questioned.

Previous investigations have shown that motivational factors are highly predictive of rehabilitation outcome (10;12;13). This economic evaluation constitutes a first attempt to estimate the impact of motivation as a predictor of total costs in the prolonged time perspective. In the highly motivated patients, the additional improvement in favor of the rehabilitation group was 11.0 global NHP score units, indicating a further improvement during the following years (11), which could make the direct costs more acceptable. Indications of reduced indirect costs in favor

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of the rehabilitation group were found until the three-year follow-up. To improve the durability of this progress still further, booster treatments should be considered. Among latently motivated patients, the examined rehabilitation failed to improve health-related quality of life additionally. The study underlines the need to develop further screening tools, while paying extra attention to psychosocial and motivational aspects.

It may be argued that a randomized design would have been preferable. However, at the time this study was organized, this design was not possible for organizational and ethical reasons. To some degree, this was compensated for by matching the rehabilitation group with the control group. The matching criteria were selected to avoid differences known to be predictors of rehabilitation outcome (11). We are inclined to believe that the lack of randomization did not play a major role in the conclusions that were drawn, as we think the patient group examined is representative of the clinical reality.

The primary outcome measure was the NHP, regarded as one of the gold standards for measuring quality of life in the early 1990s. If a health index such as EuroQol had been used, calculations of utilities in which the effects are expressed as Quality-Adjusted-Life-Years would have been possible (6;14). However, the development of the Swedish version of the index had not been completed at the time this study was organized.

The cost of medicine and general illness were not taken into account in our study. Nor were the costs borne by patients, their families, and employers, which would have additionally improved the study.

Policy Implications

In the long-run, the evaluated four-week, full-time multidisciplinary rehabilitation improved the highly motivated patients' quality of life most cost-effectively. The latently motivated patients may require rehabilitation, which is less intensive and of a longer duration, to improve their health in a whole-person perspective. The burden of prolonged musculoskeletal disorders to society was reaffirmed. Motivation could be a predictor of total costs, a factor that has to be taken into account in the examination procedure.

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