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ORIGINAL REPORT

EVALUATION OF A MULTIPROFESSIONAL REHABILITATION PROGRAMME FOR PERSISTENT MUSCULOSKELETAL-RELATED PAIN: ECONOMIC BENEFITS OF RETURN TO WORK

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Objective: **The aim of this study was to evaluate the economic consequences of an 8-week multiprofessional rehabilitation programme for patients with persistent pain.**
Subjects: **A group of 67 patients following the programme and a comparison group of 322 patients.**
Methods: **The effect on return to work was estimated using 3 different methods: (*i*) a matched sample approach; (*ii*) regression analysis; and (*iii*) propensity score matching. The economic benefit of the programme was estimated as a reduction in production losses due to sick-leave. This benefit was compared with the actual cost of the programme.**
Results: **The benefit of the programme was estimated to be €3,799–7,515 per treated patient and year. The total cost of the programme was estimated to be €5,406 per patient. Based on these figures the total cost of the programme, including costs for patients remaining on sick-leave, had been recovered when the successfully rehabilitated patients had worked for 9–17 months. Any additional work after that yielded net economic benefits.**
Conclusion: **Since other studies indicate that a large proportion of the patients working after one year also work after 3 and 6 years, we conclude that this multiprofessional rehabilitation programme for patients with persistent pain most likely generates substantial net economic gains.**

Key words: multiprofessional rehabilitation programme, persistent musculoskeletal pain, economic benefits, return to work.

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INTRODUCTION

For patients on long-term sick-leave with persistent musculoskeletal pain, multiprofessional rehabilitation programmes combining education, cognitive behavioural strategies and exercise training are suggested to be the most appropriate treatment. They have shown good results, in respect of a reduction in sick-leave, experienced pain intensity and the return to work rate, in high-quality studies, where these variables were included as outcome variables, and compared with controls not receiving multiprofessional rehabilitation programmes (1–9).

In comparison with conventional treatment within primary care of patients with long-term musculoskeletal problems, such programmes have been more demanding on resources, but even so they have been shown to be the most cost-effective regarding health-related quality of life (QoL) of the patients (10). It has been suggested that treatment in multidisciplinary pain centres may produce large savings in terms of healthcare expenditure and indemnity cost (11), but there is a lack of studies evaluating the benefit of multiprofessional rehabilitation in economic terms. Such an evaluation would involve accounting for any reduction in production loss due to sick-leave.

According to a report by the Swedish council on technology assessment in healthcare (SBU), entitled "Methods of treating chronic pain: a systematic review", the total cost of persistent pain for Swedish society was estimated to be €8.2 billion (87.5 billion Swedish Crowns (SEK)) a year (1). This total cost can be divided into direct and indirect costs. The direct costs are associated with the cost of healthcare, such as appointments with a doctor, medical investigations, medical and paramedical treatments and consumption of analgesics. The indirect costs include the loss of production caused by sick-related absence from work. The direct cost was estimated to be €0.7 billion (7.5 billion SEK) and the indirect cost €7.5 billion (80 billion SEK) a year (1).

It is estimated in the study that about 260,000 individuals in Sweden aged between 18 and 64 years are on disability pension due to persistent pain. The value of the mean loss of productive work is calculated to be €27,260 (290,000 SEK) per person and per year, giving a total annual cost of €7.1 billion (75 billion SEK).

The increasing cost of the welfare systems in many Western countries has increased the demand for knowledge about the possible economic benefits of rehabilitation programmes. It has been shown that comprehensive multiprofessional programmes are more effective than smaller mono-modal programmes as regards work resumption (12–14). However, more extensive programmes cost more than smaller ones, implying that they

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are not necessarily the most cost-effective. In this study, it was considered valuable to analyse the net economic effects of a relatively extensive and thereby expensive intervention to determine whether such an intervention was justified from a purely economic point of view.

Aim

The aim of the present study was to evaluate the economic consequences of an 8-week, work-related, multiprofessional medical rehabilitation programme for patients on long-term sick-leave with persistent musculoskeletal-related pain. The study does not aim to evaluate the cost-effectiveness of the programme, but simply to compare the economic consequences of 2 alternatives: "treatment as usual" and a specific extensive, work-related, multiprofessional rehabilitation programme.

The study documented the amount of sickness absence one year after the end of the rehabilitation programme and compared this with a similar group of matched patients who had not been granted the specific 8-week programme. The important economic gain from the perspective of society is that it ends a period of indirect costs in terms of the loss of that person's productive work. The economic benefits will thus be considered in terms of the increase in production associated with an increase in time at work, i.e. a decrease in sick-leave.

Each individual resuming work after a period of sick-leave reduces the cost of sickness allowances paid through the social insurance system. It is important to make clear that such allowances only constitute a transfer of income – from the taxpayers to the sick-leaver – influencing the distribution of income (within the society), but not the overall level. Since we have no basis for making judgements about the desirability of changes in income distribution, the study does not consider any effects of the rehabilitation programme on the payment of sickness allowances. A change in production related to a change in labour input will however affect the level of income for society as a whole. Since an increase in total income increases overall consumption possibilities, from an economic point of view a higher income is preferable to a lower one. Therefore, we used changes in production as the basis for our calculations of the economic benefits.

The economic benefits are, of course, only one aspect of the benefits of decreased sick-leave. Several other improvements usually occur at the level of the individual, e.g. in quality of life (1, 4, 15, 16).

METHODS

The Department of Rehabilitation Medicine at the Karolinska University Hospital in Huddinge, Sweden, offered an 8-week multiprofessional work-related rehabilitation programme for patients on long-term sick-leave with persistent musculoskeletal-related pain. The objectives of the clinical rehabilitation programme were: (*i*) return to work; (*ii*) increased activity level; and (*iii*) reduced pain intensity. The multiprofessional rehabilitation programme included; information, education, pain management, social training, physical exercise, ergonomics and cognitive behavioural strategies and have been described in detail previously (4, 5, 6, 17). In short, the programme demanded the presence of the patients for 7.5 hours 5 days a week during an 8-week period. Each participant in the programme received an individual plan preparing for a return to work after the 8-week programme. The plan was set up during the first 3 weeks and the programme for the following weeks was adapted individually to achieve the objectives with a work-related approach. The team used different tools to measure, observe and evaluate the patient's medical, physical, psychological and social functions, the patient's ability to work and the patient's pain situation.

At the end of the 8-week programme a rehabilitation group meeting was organized where the patient, team members and other persons involved in the patient's rehabilitation were present. The effects of the rehabilitation programme on the patient's functioning were presented and further rehabilitation was planned in detail.

The multiprofessional team

The multiprofessional team comprised one physician with specialist competence in rehabilitation medicine and in pain management, one physician undergoing specialist training, 3 physiotherapists, 3 occupational therapists, one psychologist, one social counsellor, one enrolled nurse and one medical secretary.

Subjects

A total of 72 patients were enrolled in the rehabilitation programme in 1998. Of these, 67 completed the programme and could be followed up after 1 year (7% dropped out) (Table I). The results have been presented in a recent study, with a return to work rate of 63% at the 1-year follow-up and 49% at the 3-year follow-up (5). For demographic data see Table I. The patients in the study were a selected group referred to an 8-week multiprofessional rehabilitation programme. Other treatment or rehabilitation had failed. One-third of the patients were referred from general practitioners, one-third from hospitals and one-third from the local Social Insurance Office. Note that the way the patients were selected gives us no reason to expect that they were on average more motivated for treatment or less ill than other patients with persistent musculoskeletal-related pain.

Comparison group

Patients were recruited by the National Social Insurance Office, who invited the patients, by post, to take part in a multidisciplinary evaluation at the Diagnostic Centre, at the Karolinska University Hospital in Solna. They were, like the study group, on long-term sick-leave, with long-lasting musculoskeletal-related pain and were followed up after one year regarding the return to work rate, but were not referred to any rehabilitation programme by the Diagnostic Centre and, in that sense, they represent "treatment as usual". A total of 322 patients completed the multidisciplinary evaluation at the Diagnostic Centre, during the same time period as the study group and were used as potential controls. This group of patients was used to find pair-wise matched controls regarding the following variables: age, gender, origin and time on sick-leave before intervention (Table I). It was also used as the basis for estimating the effect on the probability of return to work using regression analysis and propensity score matching techniques.

We have no reason to believe that the individuals in the comparison groups had inherently greater difficulties to return to work than the patients following the rehabilitation programme. The comparison group had no extra cost for a comprehensive multiprofessional programme.

Table I. *Patient characteristics*

	Study group	Matched comparison group
Age (years), mean (SD)	40 (8)	40 (8)
Women (%)	81	81
Immigrants (%)	45	45
Sick-leave (months), mean (SD) median before entering the rehabilitation programme or assessment	22 (21) 13	19 (19) 13

SD: Standard deviation.

Economic effects of return to work

One of the most important benefits of rehabilitation programmes is the creation of "healthy time" (18), which can be spent in leisure and work. There is value in an improved state of functioning, partly through the increase in the QoL of the patient, but also through production gains for society as a whole, as more time is spent working.

A sufficient condition for a work-related rehabilitation programme to be successful in economic terms is that the cost of the rehabilitation programme does not exceed the benefits in terms of a decrease in production loss stemming from return to work. The programme may still be successful even if this condition is not satisfied, because there may be benefits from an improved QoL for the patient and for the part of his or her family, etc. Here we have focused exclusively on the benefits in terms of a decrease in production loss and interpreted the results as a lower bound of the estimated benefits of the rehabilitation programme.

In the present study, the total extra costs for the 8-week rehabilitation programme of the study group were calculated. Treatment of the comparison group was not associated with any such extra cost; it only involved costs of "treatment as usual". The healthcare cost of the comparison group was taken to be equal to the non-rehabilitation part of the overall healthcare costs of the study group, since both groups had the same kind of musculoskeletal-related pain diagnoses and had been on sick-leave for more than 3 months prior to evaluation. The cost of the rehabilitation programme was the actual cost for the staff at the university hospital, including salaries, overheads, rental of office space/therapy rooms and working expenses. These costs were compared with the economic benefits of the 8-week rehabilitation programme, measured in terms of increased production stemming from an increase in time at work, i.e. a decrease in sick-leave.

An employee's contribution to overall production was assumed to equal the cost of employing him or her: essentially, wages plus any additional costs incurred by the employer to employ the person (18).

The difference in days on sick-leave was calculated as the last continuing period of time on sick-leave before the rehabilitation programme or evaluation and this is used as a matching variable. At the 1-year follow-up the number of persons who did not receive any allowance from the National Social Insurance Office was recorded in both groups. For the persons who had returned to work or were work ready the period of sick-leave was ended.

In this study we do not have information on the patients' actual wages after they returned to work. We therefore have to proxy their wage costs using information on the overall distribution of such costs. Since the proportions of blue-collar and white-collar workers were recorded, we take into account that wage costs differ between these groups. In our main specification the wages were proxied by the national averages of blue-collar and white-collar workers in the private sector. Wages were multiplied by 1.42 in order to take into account payroll taxes of approximately 42%. The economic calculations have been performed using SEK and € with an exchange rate of 100 SEK = €10.87, 1€ = 9.20 SEK.

The study was conducted in accordance with the Helsinki Declaration and approved by the ethics committee of Karolinska Institutet.

Statistical analysis

Statistical analysis was carried out using standard procedures. Descriptive analyses of demographic data for patients were preformed using the χ^2-test. As mentioned previously, for every patient in the study group a matched control was identified regarding age, gender, origin and time on sick-leave prior to the evaluation or start of the rehabilitation programme. The procedure used to match a patient in the study group to a patient from the potential comparison group of 322 individuals was as follows: (*i*) a group of potential matches by conditioning on gender and origin was created; (*ii*) out of the group of potential matches the individual with the previous sick-leave period closest to the patient in the study group and whose age difference was less than or equal to 3 years (provided that the difference in sick-leave period was less than or equal to 12 months) was chosen; (*iii*) for those patients in the study group who remained unmatched, the individual with the closest previous sick-leave period and whose age difference was less than or equal to 4 years (provided that the difference in sick-leave period was less than or equal to 16 months) was then chosen; and finally (*iv*) for those patients in the study group who remained unmatched, the individual with the closest previous sick-leave period and whose age difference was less than or equal to 5 years (provided that the difference in sick-leave period was less than or equal to 24 months) was chosen. With this procedure we managed to find a matched control for 66 out of the 67 patients in the study group. For the last individual, we had to allow an age difference less than or equal to 10 years and a difference in previous sick-leave period of 80 months. Given the poor match for this one patient, we checked whether our results were affected by excluding this pair from the calculations.

With the matching procedure chosen, we allowed for the possibility that the same individual in the potential comparison group was matched multiple times. Seven individuals were matched twice with a patient in the study group, 3 were matched 3 times, one was matched 4 times and one was matched 5 times.

For the paired samples statistics, the *t*-test was used. The reason for this was that the variables age and income were approximately normally distributed. To evaluate the differences in the return to work rate between the 2 groups at the 1-year follow-up, the McNemar test was performed. To test whether the differences in actual full-time work was statistically significant the Wilcoxon signed rank test was used.

With the procedure described above, the patients in the study group were matched with patients from the comparison group based on observable characteristics. The outcome in terms of return to work was then compared between the 2 groups and the average difference interpreted as an estimate of the average effect of the rehabilitation programme. Whereas the matching procedure should lead to an unbiased estimate of the effect, it may not be efficient since we are using only a subset of the information available for patients who did not participate in the programme. We therefore estimated the effect in 2 additional ways: by carrying out regression analysis and by using propensity score matching techniques. In both cases we use the full sample of 322 patients who did not participate in the rehabilitation programme.

The regression analysis was carried out based on a linear probability model as well as a probit model. The dependent variable was defined as a binary variable taking the value 1 if the patient had returned to work at a 1-year follow-up and 0 otherwise. Control variables included were gender, origin (Swedish or non-Swedish), occupation (white-collar or blue-collar), previous sick-leave history and age. Statistical inference was based on the Huber/White/sandwich estimator of variance (19).

In this study, a value of $p < 0.05$ was considered statistically significant.

RESULTS

The study group and the pair-wise matched comparison group consisted of 67 patients each with a mean age of 40 years (standard deviation (SD) 8). The female:male distribution was 4:1 and 45% were immigrants. The study group had been on sick-leave for on average 22 months (SD 21, median 13 months) prior to the rehabilitation programme. For the matched control group the corresponding figures were 19 months (SD 19, median 13 months). In the study group, there were 64% blue-collar workers and 36% white-collar workers and in the control group 55% blue-collar workers and 45% white-collar workers (Table II).

None of the patients in the study group were at work at the start of the programme and none of the patients in the comparison group were at work at their initial evaluation. At

Table II. *Distribution of blue-collar and white-collar workers in the study group and comparison group and of number of returned to work or in work-related activities (return to work rate in %) at the 1-year follow-up*

Profession	Study group Total $n = 67$	Study group Immigrants $n = 30$	Study group Native Swedes $n = 37$	Matched comparison group Total $n = 67$	Matched comparison group Immigrants $n = 30$	Matched comparison group Native Swedes $n = 37$
Blue-collar work, *n* (%)	43 (64)	25 (83)	18 (49)	37 (55)	17 (57)	20 (54)
White-collar work, *n* (%)	24 (36)	5 (17)	19 (51)	30 (45)	13 (43)	17 (46)
Returned to work at 1-year follow-up, *n* (%)	42 (63)	17 (57)	25 (68)	16 (24)	7 (23)	9 (24)

a 1-year follow-up the actual return to work rate in the study group was recorded in a telephone interview with the patients' responsible local social insurance office. Forty-two (63%) of the 67 patients had returned to work, working halftime (4 h/day) or more, or they were in active work-related activities (Table II). Eleven of these work-ready patients who were in work-related activities were studying, practising or involved in activities of the Employability Institute (The Swedish AF-rehab is an institute to help patients find, gain and keep a job primarily on the open competitive market). One of the 11 in work-related activities was work-ready and was looking for a job on the open market.

In the comparison group the patients' actual return to work was recorded at a 1-year follow-up with the local Social Insurance Office. Sixteen of the 67 patients (24%) had returned to work (the 39% difference is statistically significant with $p < 0.001$, see Table II). Among those patients who had returned to work, it was not possible to record if they were working full-time or part-time. To interpret the results as a lower bound on the effect of the rehabilitation programme, all patients who had returned to work in the matched control group were taken to be full-time workers.

In the study group, some of the patients stated that they were working part-time at the 1-year follow-up. To take this into account we use the number of working hours per day used by the Swedish Social Insurance Office to translate the effect on return to work to a change in working time: full-time = 8 h/day, 75% = 6 h/day, 50% = 4 h/day or 25% = 2 h/day.

Taking the number of working hours per day into account, the corresponding return to work rate for the whole group measured in full-time jobs was 30.5 for the patients following the programme and 16 for the patients in the comparison group, a difference of 14.5 ($p < 0.001$) (Table III). Thus, compared with normal treatment of patients with persistent musculoskeletal-related pain, the extensive 8-week rehabilitation programme was associated with an increase in the number of full-time jobs about twice as high as "treatment as usual".

When using regression analysis and propensity score matching to estimate the effect of the rehabilitation programme, we only assess its effect on return to work, not on the number of full-time jobs. In carrying out regression analysis, we have used a parsimonious specification with the control variables entering without any transformation (Table IV). Propensity score matching is carried out using a routine developed by Becker & Ichino (20). We report the estimated "average treatment effect on the treated" (ATT) based on kernel as well as radius matching (Table V).

Table III. *Difference between the matched pairs divided into white-collar workers (WCW) and blue-collar workers (BCW) and the difference in recaptured full-time work at the 1–year follow-up ($p < 0.001$)*

% of full-time work	Study group	Matched comparison group
WCW (n)		
100 (8 h/day)	8	7
50 (4 h/day)	7	0
Recaptured full-time work	11.5	7
BCW (n)		
100 (8 h/day)	10	9
75 (6 h/day)	2	0
50 (4 h/day)	15	0
Recaptured full-time work	19	9
Total	30.5	16

Table IV. *Results based on regression analysis*

	Linear regression Coefficient	Probit regression Marginal effect
Treatment	0.166 (0.020)	0.146 (0.046)
Age	–0.005 (0.045)	–0.005 (0.052)
Gender	0.008 (0.881)	0.005 (0.929)
Origin	–0.034 (0.526)	–0.041 (0.477)
Sick-leave history	–0.0002 (0.000)	–0.0003 (0.000)
Occupation	–0.056 (0.252)	–0.062 (0.231)
Constant	0.703 (0.000)	
Number of observations	388	388
R-squared	0.101	0.087

Numbers in parentheses are *p*-values. In linear regression they are based on the Huber/White/sandwich estimator of variance. Reported R-squared for the probit regression is pseudo R-squared. Treatment, gender, origin and occupation are dummy variables and the reported marginal effects the estimated effect of a change from 0 to 1.

The different methods yield point estimates that are relatively similar, ranging from a 14.1% to 22.7% higher probability of being in work for patients in the study group. These estimates are substantially lower than the 39% (42–16 = 26; 26/67 = 38.8%, Table II) obtained by matching directly on observable characteristics and not accounting for part-time work, but close to the 21.6% (Table VI) obtained by accounting for the fact that several patients in the study group worked part-time at the 1-year follow-up. We cannot reject the hypothesis that the effect on return to work is the same for white-collar and blue-collar workers (the *p*-value of an F-test is 0.59 based on the linear probability model and the *p*-value of a χ^2-test is 0.57 based on the probit model).

The cost of the multiprofessional rehabilitation team is described in Table VII. The wages per month were multiplied

Table V. *Results based on propensity score matching*

	Kernel matching method	Radius matching method
Average treatment effect*	0.227	0.141
Standard error†	0.162	0.097
t-value	1.406	1.450
Number of controls	322	169

*The average treatment effect is on the treated.
†Reported standard errors for the kernel matching method are based on bootstrapping.

by 1.42 in order to take payroll taxes into account. The total cost for the 8-week programme was estimated to be €127,370 (1,171,830 SEK). Since there were 2 groups of 8 patients in the rehabilitation programme at the same time the total cost per patient was calculated by dividing €127,370 (1,171,830 SEK) by 16, resulting in €7,950 (73,125 SEK). For our evaluation of the economic costs and benefits of the programme, the relevant cost component is the difference between the costs incurred when running the programme and the costs incurred if the programme had not taken place. Since some of the costs accounted for in Table VII would have been incurred independent of whether the programme took place, we have to deduct these costs to isolate the relevant cost component for our evaluation. The multiprofessional team members did not spend all their time during the duration of the programme treating the patients in the study group. Therefore, we need to deduct the cost for the team during the time they were involved in other activities. We estimate that they used approximately half of their working time for the programme and the rest for other activities such as teaching, training, research, staff meetings and other rehabilitation programmes and evaluations. The total cost for the rehabilitation programme per patient was thus estimated to be €5,406 (49,735 SEK). This includes half of the wage costs, but the complete consulting costs, other running costs, cost for facilities, overheads and miscellaneous (Table VII).

In translating the effect on return to work to effects on production losses, we proxy the cost of employing white-collar and blue-collar workers by the private-sector average for each subpopulation in 1998. According to Statistics Sweden, the average monthly salary of white-collar workers was €2,424 (22,300 SEK), while the average monthly wages for blue-collar workers was €1,864 (17,150 SEK) (the latter figure is calculated by multiplying the average hourly wage by 171, the average number of hours worked per month). These estimated values were multiplied by 1.42 in order to take into account payroll taxes.

Using the matched sample approach, we find that, in total, this generated a value of the decrease in production losses equal to €39,584 (364,173 SEK) per month (€475,010 or 4,370,092 SEK per year) for the white-collar workers and of €50,290 (462,669 SEK) per month (€603,493 or 5,552,028 SEK per year) for the blue-collar workers in the study group. For the control group the value of the decrease in production losses was equal to €24,095 (221,676 SEK) per month (€289,136 or 2,660,112 SEK per year) for the white-collar workers and €23,821 (219,159 SEK) per month (€285,865 or 2,629,908 SEK per year) for the blue-collar workers. The difference in the value of the decrease in production losses between the study group and the comparison group was €185,873 (1,710,072 SEK) for white-collar workers and €317,628 (2,922,120 SEK) for blue-collar workers with a total of €503,501 (4,632,192 SEK) per year (see Table VI).

An issue here is the possibility that the patients in the study group are non-representative in the sense of having on average lower productivity than the overall population. If this were the case, we would tend to overestimate the economic benefits of

Table VI. *Estimated economic benefits (in Euro) based on mean wage costs and wage costs in lower quartile and different matched samples (€1 = 9.20 SEK)*

	Matching 1 (67 pairs)			Matching 2 (66 pairs)		
	Study group	Control group	Difference	Study group	Control group	Difference
White-collar workers						
Full-time work at 1-year follow-up, *n*	11.5	7	4.5	11.5	7	4.5
Production increase per year (mean wage costs; €)	475,009.80	289,136.40	185,873.40	475,009.80	289,136.40	185,873.40
Production increase per year (wage costs in lower quartile; €)	341,536.20	207,891.60	133,644.60	341,536.20	207,891.60	133,644.60
Blue-collar workers						
Full-time work at 1-year follow-up, *n*	19	9	10	18.5	9	9.5
Production increase per year (mean wage costs; €)	603,493.20	285,865.20	317,628.00	587,611.80	285,865.20	301,746.60
Production increase per year (wage costs in lower quartile; €)	511,951.20	242,503.20	269,448.00	498,478.80	242,503.20	255,975.60
Value of total production increase per year (mean wage costs; €)	1,078,503.00	575,001.60	503,501.40	1,062,621.60	575,001.60	487,620.00
Value of total production increase per year (wage costs in lower quartile; €)	853,487.40	450,394.80	403,092.60	840,015.00	450,394.80	389,620.20
Total number of full-time jobs	30.5 (45.5%)	16 (23.9%)	14.5 (21.6%)	30 (45.4%)	16 (24.2%)	14 (21.2%)
Total benefit per patient (mean wage costs; €)	16,097.10	8,582.10	7,514.90	16,100.30	8,712.10	7,388.10
Total benefit per patient (wage costs in lower quartile; €)	12,738.60	6,722.30	6,016.30	12,727.50	6,824.10	5,903.30

The mean wage cost of white-collar workers has been set to €3,442.1 and for blue-collar workers to €2,646.9 per month. The wage cost in the lower quartile of white-collar workers has been set to €2,474.9 and for blue-collar workers to €2,245.4 per month.

Table VII. *Cost of the multiprofessional rehabilitation programme and cost per patient in the programme in Euro (€1 = 9.20 SEK)*

Multiprofessional team (*n*)	Wages/month	Cost/month	Cost/year	Total/year	Total cost/8-week*	Total cost/patient**
Senior physician (1)	5,543	7,872	94,461	94,461	14,533	909
Physician (1)	3,913	5,557	66,678	66,678	10,150	634
Enrolled nurse (1)	1,739	2,470	29,635	29,635	4,559	285
Social counsellor (1)	2,283	3,241	38,896	38,896	5,984	374
Physiotherapist (3)	2,173	3,087	37,043	111,130	17,097	1,068
Occupational therapist (3)	2,283	3,241	38,896	116,687	17,952	1,121
Secretary (1)	1,902	2,701	32,413	32,413	4,987	312
Psychologist (1)	2,337	3,318	39,822	39,822	6,126	383
Total (12)		31,487		529,721	81,387	5,085 2,542†
		Other running costs	10%	52,646	8,099	507
		Consulting cost		5,435	837	52
		Subtotal		587,802		
		Facilities		123,913	19,064	1,181
		Overhead cost	10%	58,454	8,933	562
		Miscellaneous	10%	58,454	8,993	562
		Total		828,624	127,373	7,950 5,406†

*The total cost per year was divided by 6.5 to calculate the total cost per 8-week period.
**Since there were 2 groups of patients in parallel and separate, with 8 patients in each group the sum was divided by 16 to obtain the total cost per patient.
†The total cost of the programme was estimated to be €5,406 (49,736 SEK) when 50% of the wage cost was used.

the programme by assigning a measure of average productivity to this group of patients. In order to assess how sensitive our results are to the assumption that their productivity is captured by a measure of the national average we will carry out the calculations based on the wage costs found at the lower quartile in the national wage distribution as well. By using information on how wages in the lower quartile differed from mean in 2000 (the earliest year for which this information is available at Statistics Sweden), we find that the total difference in the value of the decrease in production losses between the study group and the comparison group was €403,093 (3,708,452) per year (see Table VI). The reduction in production losses is thus estimated to be 20% lower if we use the wage costs at the lower quartile as the basis for our calculations.

To calculate the economic benefit of the rehabilitation programme the estimated benefit of €503,501 (4,632,192 SEK) using the matched sample approach was divided by 67, the number of patients who participated in the programme. This gave a total of €7,515 (69,138 SEK) per patient and year using the mean wage costs (and €6016 per patient and year using the wage costs at the lower quartile). The lowest estimated effect on return to work based on the other 2 methods – regression analysis and propensity score matching – is 14.1%. Using this estimate as a basis for the calculation of economic benefits along with the assumption that the relevant proxy for production is the blue-collar wage at the lower quartile (wage cost: €26,944.8) we get an estimated economic benefit per patient and year of €3,799 (34,953 SEK) (Table VIII). Note that this estimated benefit is based on the worst possible assumptions regarding the estimated effect on return to work as well as the productivity of the patients.

Table VIII. *Estimated economic benefits (in Euro) based on wage costs of blue-collar workers in lower quartile (€1 = 9.20 SEK)*

Wage cost of blue-collar worker in the lower quartile	26,944.80
Estimated effect on return to work	14.1%
Estimated benefit per patient per year of programme	3,799.20
Full cost per patient of programme	7,950.00

The wage cost of blue-collar workers has been set to €2,245.4 per month.

Since the total cost of the programme was estimated to be €5,406 (49,735 SEK) per patient, the programme was estimated to be economically beneficial within one year after the successfully rehabilitated patient had returned to work based on the matched sample approach and within 1½ years based on the approach where we use the worst possible assumptions. Note that this estimate takes into account the cost for the patients who do not return to work.

Let us define the economic break-even point as the time needed for the successfully rehabilitated patients to work in order for the economic benefits to exactly equal the costs of the programme. When using the matched sample approach and mean wages to capture production, we find that it occurred after 8.6 months (this was calculated by multiplying €5,406/7,515, or 49,735/69,138 SEK, by 12). When using the wages at the lower quartile we find that it occurred after 10.8 months (this was calculated by multiplying €5,406/6,016 by 12). In other words, using this method we find that after a period of time between 8.6 and 10.8 months, the benefit to society from an increase in productive work on the part of the successfully treated patients would have paid for the treatment not only of these patients, but also for the treatment of those who remained on sick-leave.

Based on our worst possible calculation – from the point of establishing economic net benefits – the break-even point occurred after 17.1 months. That is, the break-even point occurred after about 1 year and 5 months.

DISCUSSION

The present study showed that the economic gains of the multiprofessional programme surpassed the costs after the successfully rehabilitated had worked for about 10 months (9–11 months). Any additional month worked after this constituted a pure economic benefit for society. As known from the 3-year follow-up, 50% of the patients were still at work (5), a decrease from 63%. By reducing the €7,515 (69,138 SEK) with approximately 13% leaving €6,538 (60,149 SEK) per patient and per year that would give a benefit of €19,614 (180,448 SEK) per patient after 3 years. Comparing this with the cost of the programme per patient (€5,406 or 49,736 SEK) resulted in a gain for society of 3.6 times the running cost of the programme.

The result that break-even of costs-benefits occurs when the successfully rehabilitated persons had worked for 10 months raises the question when, in relation to the rehabilitation programme, is this point in time? To estimate this, we used the results of a study by Kärrholm et al. (21). This study shows that the effect on work resumption of a multiprofessional co-operation project in vocational rehabilitation occurred during the second half-year after the end of the rehabilitation intervention, and not during the first half-year. Using this result, transferring it into the present study, and assuming that the average point in time for work resumption was 9 months after the end of the rehabilitation programme, would give the following figures: 9 months after end of the rehabilitation programme they began working and they needed to work for about 10 months to attain the break-even point. It means that approximately 1 year and 7 months after the end of the rehabilitation programme, it may be estimated that the economic gains of the intervention surpassed the costs of the rehabilitation programme (for the successfully rehabilitated as well as for the not-successfully rehabilitated with regard to work resumption).

Suggesting that the multiprofessional team would have spent all their working time (100%) just for the rehabilitation programme would have given the following results. The total cost per patient and year was estimated to be €7,950 (73,125 SEK). Using the mean wages to capture productivity €7,950/7,515 (or 73,125/69,138 SEK was multiplied with 12 and by using the wages of the lower quartile €7,950/6,016 multiplied by 12. This will result in a benefit for society after approximately one year and some time less than 16 months, respectively. As explained above, the multiprofessional team was involved in other activities and programmes outside of the 8-week programme.

As shown in an earlier study (6) where 122 patients with similar problems were followed up after 6 years, 52% were still at work and had remained in a life including work. Using the same figures as in that study the benefits for society would be €39,228 (360,894 SEK); at least 7 times the running cost of the rehabilitation programme.

Gratchel et al. (22) showed that early multidisciplinary intervention for high-risk patients was more cost-effective than conventional treatment.

Another issue for discussion would be if you could generalize the results from earlier studies. For example, in a study the results for patients who fulfilled the inclusion criteria for taking part in a study for pain rehabilitation were compared with the patients who for any reason could not be randomized to take part in the study. It was shown that the 2 groups were comparable, but the pain rehabilitation programme showed a better outcome for the patients who could be randomized to take part in the study (23).

Many of the rehabilitation programmes are offered at highly qualified specialist departments where most of the studies are also performed. Patients referred to these departments could have more severe or complex consequences of pain than patients being treated in primary care (24, 25).

McQuay et al. (26) reported that the use of multidisciplinary pain clinics generated direct health service savings equal to twice their running cost.

There are also studies showing good results of implemented multiprofessional programmes in primary care (27). Ideally, effects such as an increase in the patient's well-being should be included in a proper cost-benefit analysis of a rehabilitation programme. Benefits may arise through improved physical, social and emotional functioning of the patient, less time spent by family members in taking care of the patient, etc. However, the economic value of these types of effects is notoriously difficult to measure (18). By focusing on the production gain for society, therefore, one is only capturing a conservative estimate of the benefits of the rehabilitation programme.

A weakness of the study from a research design point of view is that the study group and the comparison group are not completely randomly selected. The matching procedure to some extent compensates for this disadvantage but, ultimately, it only takes into account systematic differences in return to work behaviour that is correlated with the characteristics we are able to observe. There could be other influencing factors that we are not able to observe and therefore control for. We need to bear in mind that our estimated benefits may be biased upwards if we have failed to control for some factor that makes the patients following the programme more prone to return to work independent of the actual treatment. To minimize the matching problems, 3 different ways of analysis were chosen: direct matching, regression analysis and propensity score matching. The direct matching gave a break-even point after 9 months and when using the worse possible alternative the break even-point occurred after 17 months.

While up to 85% of the population will suffer from musculoskeletal pain, only a small number will account for most of the cost (28–30). In general, less than 10% may consume up to 75% of the resources (31).

Thus, preventing disability and high-cost cases may result in large economic savings, and these people constitute a special target for prevention programmes.

As explained above, our matching procedure resulted in matches with different quality in terms of how similar the control group was compared with the patients in the study group. In particular, there were substantial differences in age as well as previous sick-leave for one of the matched pairs. In order to investigate whether our results were sensitive to the inclusion of this pair, we calculated the economic benefits excluding this pair and compared the results (see Table VI). The economic benefit per patient and per year fell somewhat when we excluded the poorly matched pair, but the change was very small (a fall from €7,515 to €7,388, which constituted a reduction of about 1.7%).

In conclusion, this study shows that the 8-week rehabilitation programme for patients on long-term sick-leave with persistent musculoskeletal-related pain is beneficial to society after the successfully treated had worked for between 9 and 17 months. Assuming that patients who were observed to remain working after 3 years have done so for the full 3 years, the economic benefits were more than 3.5 times the running cost. On the same assumption, after 6 years the economic benefits were at least 7 times the running cost. Note that we compared the benefits arising from successfully treated patients to the full cost of the programme, i.e. including the costs for those patients in the programme who did not return to work.

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