Return to work for temporary agency workers and unemployed workers, sick-listed due to musculoskeletal disorders

Vermeulen, S.

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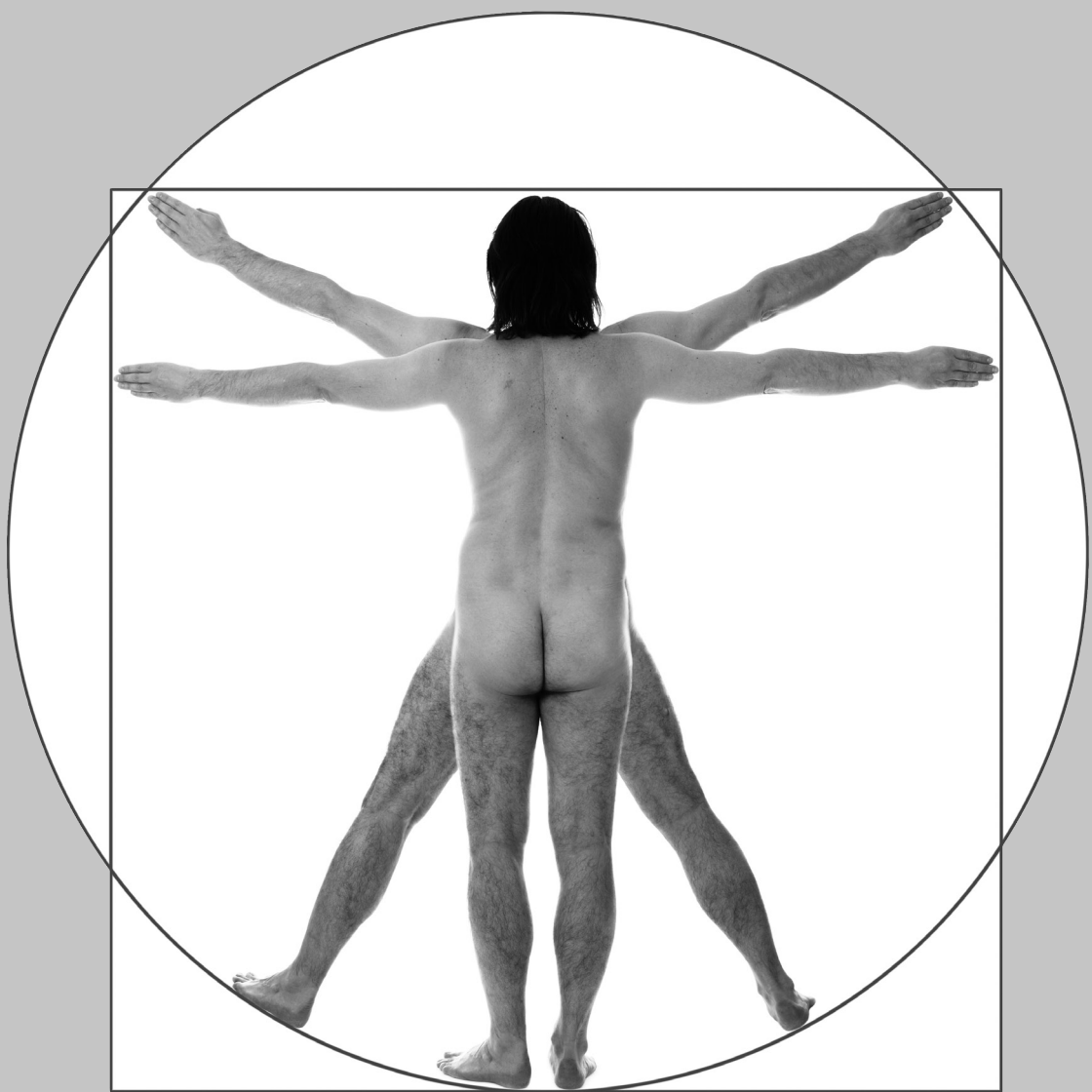

Chapter 7

Economic evaluation of a participatory return-to-work intervention for temporary agency workers and unemployed workers sick-listed due to musculoskeletal disorders

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ABSTRACT

Objectives

To evaluate the cost-effectiveness, cost-utility, and cost-benefit of a newly developed participatory RTW program for temporary agency workers and unemployed workers, sick-listed due to musculoskeletal disorders.

Methods

An economic evaluation was conducted alongside a randomized controlled trial with a 12-month follow-up. Temporary agency workers and unemployed workers, sick-listed for 2 to 8 weeks due to musculoskeletal disorders, were randomized to the participatory RTW program group (n=79) or usual care group (n=84). The new RTW program was aimed at making a consensus-based RTW action plan with the possibility of a temporary (therapeutic) workplace. Effect outcomes were sustainable RTW and quality adjusted life years (QALYs). Health care utilization was measured from social insurer's perspective and societal perspective.

Results

Total health care costs in the participatory RTW program group (€10,189; SD 7,055) were statistically significantly higher compared to care as usual (€7,862; SD 7,394). The cost-effectiveness analyses showed that the new intervention was more effective but also more costly than usual care, i.e. to gain one day earlier RTW in the participatory RTW program group approximately 80 Euros needed to be invested. The net societal benefit of the participatory RTW program compared to care as usual was 2,073 Euros per worker.

Conclusions

The newly developed participatory RTW program was more effective but also more costly than usual care. The program enhanced work resumption and generated a net socioeconomic benefit. Hence, implementation of the participatory RTW program may have the potential to achieve a sustainable contribution of vulnerable workers to the labour force.

INTRODUCTION

The socioeconomic impact of musculoskeletal disorders (MSD) among the working population is significant. Findings in the international literature consistently have shown that MSD-related long-term sickness absence, i.e. chronic work disability, accounts for the majority of the societal costs.[1-5] Direct health care costs represent only a minor part of the economic burden.

To achieve evidence-based and efficient occupational health care it is essential to gain insight into the relationship between the input of financial resources and the achieved results. From this perspective, there is an upcoming demand for methodological high quality economic evaluation of occupational health care interventions.[6, 7] Key question is whether the beneficial effect(s) of a (newly developed) intervention is worth the (extra) costs, when comparing to, for instance, usual care. After all, provided the presence of substantial effects, an intervention with higher costs can still be cost-effective. Conversely, an intervention with the low costs is not necessarily the most cost-effective.

Within the field of occupational health care research, development of return-to-work (RTW) interventions for sick-listed workers with non-standard labour agreements, e.g. temporary agency workers and unemployed workers, is uncommon.[8] However, these workers represent a vulnerable group within the working population as they are characterised by a poorer health status, a greater distance to the labour market, and an increased risk for (long-term) work disability.[9] Therefore, a participatory RTW program was developed for temporary agency workers and unemployed workers, sick-listed due to MSD.[8] The newly developed participatory RTW program consists of a stepwise process to identify and solve obstacles for RTW, resulting in a consensus-based RTW plan to facilitate work resumption. An important goal of this program is to let the sick-listed worker (re)gain control over his/her RTW process. Moreover, the program is guided by an independent RTW coordinator to warrant equality and active participation during the process of both the sick-listed worker and the labour expert representing the Social Security Agency, who guides the worker with regard to vocational rehabilitation. To offer the possibility of work resumption in a temporary (therapeutic) workplace, agreements were made with commercially

operating vocational rehabilitation agencies to find suitable (therapeutic) workplaces matching with the formulated RTW plan.

The objective of this study was to conduct an economic evaluation of the participatory RTW program compared to usual care. Cost-effectiveness was evaluated from both the social insurers' perspective and the societal perspective. Cost-benefit was evaluated from the societal perspective.

METHODS

Study design

An economic evaluation from a social insurers' perspective and a societal perspective was conducted alongside a randomized controlled trial. The study was carried out in collaboration with five front offices of the Dutch Social Security Agency (a government funded agency that provides supportive income and occupational health care for this study population) and four large Dutch vocational rehabilitation agencies. The study design, protocol, and procedures were approved by the Medical Ethics Committee of the VU University Medical Center. All participants gave written informed consent. A detailed description of the study design has been presented elsewhere.[10] The study is listed in the Netherlands Trial Register (NTR) under NTR1047.

Study population

The study was performed between March 2007 and September 2009. Eligible participants were temporary agency workers and unemployed workers (18-64 years), 2 to 8 weeks sick-listed with MSD as main health complaint for their sickness benefit claim. An overview of the inclusion and exclusion criteria has been presented elsewhere.[10]

Randomization and blinding

Randomization was performed at worker level. Workers were pre-stratified by type of worker (temporary agency worker or unemployed worker) and type of last job (degree of physical/mental demands). Further details regarding the randomization procedure and blinding have been described elsewhere.[10, 11]

Interventions

Usual care group

In the Netherlands, sick-listed workers who have no (longer an) employment contract, i.e. no employer/workplace to return to, receive sickness benefit and occupational health care by the Social Security Agency for the duration of (established) work disability. The occupational health care is provided by an insurance physician, a labour expert, and a case manager. The content of occupational health care has been reported more thoroughly elsewhere.[11]

Participatory RTW program group

The intervention group also received usual care. In addition, they were referred by their insurance physician to an independent RTW coordinator for the new participatory RTW program. The detailed content of the new participatory RTW program has previously been presented elsewhere.[10, 11] The primary aim of the participatory RTW program was to enhance early (sustainable) work resumption as step up to durable contribution to the labour force.

Effects

Primary measure of effect was duration until sustainable RTW, defined as the duration in calendar days from the day of randomization until return to work in paid regular work or regular work with supportive sickness benefit for at least 28 consecutive calendar days. Secondary outcome was Quality Adjusted Life Years (QALYs). Health-related quality of life was measured using the EuroQol-5D.[12] The utility (on a scale of 0 to 1) of the reported health states was estimated using the Dutch tariff.[13] QALYs were calculated as utility multiplied by time spent in a particular health state. Transitions between health states were linearly interpolated.[14]

Costs resources and valuation

Health care costs

Data were collected using questionnaires at 3, 6, 9 and 12 months follow-up, measuring resource use with a 3 month recall period. The questionnaires included direct health care and direct non-health care costs. Direct health care costs included primary and secondary care visits, home care, and medication use. Direct non-health

care costs included alternative medical care, informal help and day care costs. Prices used for valuing resource utilization are presented in Table 1. Dutch standard cost prices were used.[15] Medication costs were valued with cost prices of the Royal Dutch Society for Pharmacy.[16] Data on occupational health care by the Social Security Agency were collected from the continuous database registration and the medical files at the Social Security Agency. The costs were calculated based on real cost prices. The (real) costs for applied occupational health care interventions, including costs for placement in therapeutic workplaces in the intervention group, were extracted from the database records. Costs of the participatory RTW program (excluding costs of placement in therapeutic workplaces) were calculated using a bottom-up approach (see Table 2). The index year for this study was 2008.

Sickness benefit costs

The costs of sickness benefits for the participants who did not return to paid work during follow-up were retrieved from the Social Security Agency database records. The total amount of paid sickness benefits was collected for each participant after the 12-month follow-up. These data consisted of real costs.

Productivity

Productivity loss during the sickness benefit period was not measured in this study. From a societal perspective, when reporting sick, a temporary agency worker immediately falls under the Social Security Agency for sickness benefit. Also, as soon as possible, the sick-listed worker is replaced with a healthy temporary agency worker at the user company. With regard to the sick-listed unemployed workers, when reporting sick these workers were already out-of-work and thus no productivity loss is present.

In this study, productivity gain during follow-up was measured. In case of work resumption in a temporary workplace, the Social Security Agency paid sickness benefit and the employer profited from the productivity of the worker. Productivity gain was, therefore, defined as the economic benefit (from a societal perspective) of the productivity of a worker during work resumption with ongoing sickness benefit. We assumed that in case of work resumption in regular work with ending of the

sickness benefit, there was no net productivity gain from a societal perspective. We also assumed that workers were 100% productive during the hours of work resumption in a temporary workplace. To calculate the productivity gain during work resumption with ongoing sickness benefit the total number of working hours (with ongoing sickness benefit) during the 12-month follow-up were multiplied by the estimated price of productivity per hour based on age and gender. Level of education was not part of the proxy for estimation of productivity gain, because, at baseline, the level of education was higher in the intervention group. This would have resulted in higher productivity estimates in favour of the intervention group.

Data analysis

The economic evaluation was performed according to the intention-to-treat principle. Discounting of costs was not applied because the follow-up was one year. [17] Data on RTW and paid benefits were collected for all participants from the Social Security Agency database. With regard to the self-reported resource use (consisting of direct health care and direct non-health care utilization), a complete follow-up was available for 116 participants (=71.2%).

Missing cost data were completed by means of the Multivariate Imputation by Chained Equations (MICE) procedure.[18] To prevent that extreme high cost values were used to substitute missing values during the imputation process an alternative MICE procedure was used.[19] This method consisted of the following steps: 1) for each cost variable separately, cost values at the 90th percentile and higher were replaced by the total group mean; 2) an imputation model was composed containing complete cost information assessed at all follow-up moments in combination with important baseline demographic and prognostic variables such as gender, type of work, and functional disability; 3) this imputation model was used to create 10 multiple imputed datasets; 4) before the data entered the main analysis, the original cost data that were replaced by the mean cost value in the first step were set back to the original value in all 10 datasets. These steps were done separately in the intervention and control group data and afterwards datasets were merged. To pool effects and costs from these 10 complete datasets Rubin's rules were used.[20]

For the cost-effectiveness analyses, incremental cost-effectiveness ratios (ICERs)

were calculated by dividing the incremental costs (DC) by the incremental effects (DE). The ICER represents the additional costs needed to gain one extra unit of effect in the intervention group compared to the usual care group. For the cost-utility analyses (CUA), the ICUR was calculated by the difference in total costs (all health care costs and sickness benefit costs) divided by the difference in QALYs. The cost-benefit analysis (CBA) was conducted from a societal perspective and calculated the net monetary benefit by subtracting the difference in total costs between the intervention group and the usual care group from the difference in productivity gain between the two groups. Additionally, a return on investment, in which the monetary benefit is expressed as a percentage of the cost of the investment was calculated by dividing the incremental benefit (gain minus cost) by the incremental costs of the investment.[21]

Uncertainty surrounding the incremental costs were estimated using non-parametric bootstrapping with 5000 replications.[22] The 95% confidence intervals around the mean cost differences were estimated using the Approximate Bootstrap Confidence (ABC) algorithm.[23] Bootstrapped cost-effect pairs were plotted on a cost-effectiveness plane and a cost-effectiveness acceptability curve was estimated if the ICER was located in the north-east quadrant.[24]

A sensitivity analysis for the CBA was conducted to assess the effect of reduced productivity during placement in a temporary workplace with ongoing sickness benefit. We repeated the CBA assuming 75% productivity during therapeutic work resumption. Data processing was performed in SPSS 17.0. Calculation of confidence intervals, and CEA and CUA analyses were conducted in R version 2.12.[25] For all analyses a p-value of 0.05 (two-tailed) was considered statistically significant.

RESULTS

Participants

Based on the returned screening questionnaires 784 potentially eligible workers were identified. Of those, 163 workers were enrolled in the study, signed informed consent and were randomized to the participatory RTW program (n=79) or to usual care (n=84). The recruitment flow and baseline characteristics have been reported in detail elsewhere.[11] Statistically significant differences in baseline characteristics

between participants with and without complete follow-up were present with younger persons (p=0.002), more men (p=0.02), more temporary agency workers (p=0.01), and more participants who had worked until the first day of reporting sick (p=0.001) in the group without a complete follow-up.

Effects on RTW and QALYs

The median duration until sustainable first RTW was 161 days (interquartile range (IQR) 88 – 365 days) in the participatory RTW program group and 299 days (IQR 71 – 365 days) in the usual care group (p=0.10). The mean QALY (on a scale of 0 to 1) in the participatory RTW program group was 0.63 (SD=0.22) and 0.58 (SD=0.26) in the usual care group (p=0.35).

Health care utilization

There were some non-significant differences in the use of (non-occupational) health care between both groups (see Table 1). With respect to the received occupational health care, participants in the participatory RTW program group had significantly more consults with the insurance physician (p=0.001) and the labour expert (p=0.002), whereas controls had significantly more meetings with the case-manager at the Social Security Agency (p=0.000).

Costs

The total costs of the participatory RTW program were 735 Euros per worker (Table 2). These costs consisted of 1. the mean costs of training per worker (200 Euros), including trainer costs, training attendance costs for the occupational health care professionals, and additional training costs; and 2. the mean occupational health care professional costs per worker (535 Euros), representing the costs for the additional time investment by the insurance physician, the labour expert, and the RTW coordinator. Table 3 shows the total health care costs in both groups during the 12-month follow-up. The costs for occupational health care and the total Social Security Agency costs were statistically significantly higher in the participatory RTW program group. Direct health care and non-health care costs did not statistically differ between the two groups. Total health care costs were statistically significantly higher in the intervention group, mostly due to the higher Social Security Agency costs.

Table 1. Health care resource use, cost prices used, and means and standard deviations of health care utilization per group (based on the crude, non-imputed, cost data).

Type of health care	Cost price per unit (€)	Mean costs (SD)	
		Participatory RTW program	**Usual care**
Occupational health care			
Insurance physician	53[b]	108.8 (81.8)	70.9 (62.4)
Labour expert	41[b]	32.1 (43.6)	14.0 (28.9)
Case manager	29[b]	16.7 (21.2)	35.5 (33.9)
Missing value range (0%)		0	0
Primary care			
General practitioner	22[a]	31.0 (85.9)	23.7 (46.1)
Physical therapist	25[a]	261.5 (478.8)	253.8 (434.8)
Caesar therapist	25[a]	12.9 (114.7)	25.2 (122.9)
Manual therapist	34[a]	70.6 (389.1)	87.0 (392.3)
Alternative therapist[1]	Range 10-78[a,b]	40.1 (146.3)	16.5 (84.7)
Other care practitioners[2]	Range 8-500[a,b]	140.1 (546.9)	36.5 (104.7)
Outpatient care			
Medical specialist	74[a]	175.9 (465.4)	126.9 (269.4)
X-ray photo	45[a]	26.5 (46.5)	39.8 (83.5)
MRI scan	179[a]	54.4 (119.4)	53.3 (117.2)
X-ray computed tomography (CT scan)	147[a]	13.0 (53.4)	12.2 (46.7)
Lumbar puncture	47[a]	0.6 (5.3)	7.2 (43.9)
Blood tests	23[a]	10.5 (27.2)	12.4 (26.5)
Other diagnostic tests[3]	Range 36-1308[a,b]	7.1 (23.6)	21.2 (143.0)
Hospitalization	439[a]	61.2 (279.0)	88.9 (346.2)
Medication use	Range 0.1-271[c]	169.3 (523.1)	227.7 (1103.1)
Informal care costs	Range 6-29[a]	848.0 (1610.1)	795.4 (1810.5)
Missing value range (%)		19.0 – 22.8	14.3 – 21.4

[1]Consisting of 14 different alternative therapists; [2] Consisting of 17 different care practitioners; [3] Consisting of 13 different diagnostic tests. Cost price sources: [a] Price according to Dutch guidelines for costing studies; [b] Price according to professional organization or health care provider; [c] Price according to the Royal Dutch Society for Pharmacy.

Table 2. Overview of costs (Euros) of the participatory RTW program.

Resources	Description	Aggregated costs
Costs for training insurance physicians, labour experts and RTW coordinators		
Trainer costs	Training sessions; 3 trainers, 12-16 hours, 70-106 Euros per hour. Preparation training: 2 trainers, 2-8 hours, 106 Euros per hour	4226
Attendance costs insurance physicians, labour experts, and RTW coordinators	Primary and follow-up training of insurance physicians and labour experts: 5-7 insurance physicians, 6-8 labour experts, 7 hours, 81-106 Euros per hour. Primary and follow-up training of RTW coordinators: 6-9 RTW coordinators, 10 hours, 81 Euros per hour.	14635
Additional costs training	Rent for training location, refreshments, and study materials.	1118
Total training costs	Sum of trainer costs, attendance costs, and additional costs.	19979
Training costs per worker	Assumption: minimum of 20 workers at each SSA front office can receive the RTW program.	200
Costs for carrying out the participatory RTW program		
Costs of time investment insurance physician	Mean extra time investment of the insurance physician for referral of 38 workers to the RTW coordinator, 0.25 hour per worker, 106 Euros per hour.	1005
Costs of time investment labour expert	Mean extra time investment of the labour expert was 2.4 hours per worker, 81 Euros per hour, 38 workers had the meetings with the labour expert and the RTW coordinator.	7287
Costs of time investment RTW coordinator	Mean time investment of the RTW coordinator was 3.9 hours per worker, 81 Euros per hour, 38 workers.	12043
Professional costs per worker referred to the RTW coordinator		535
Total costs per worker		
Total costs per worker not referred to the RTW coordinator	Constitutes of the training costs per worker	200
Total costs per worker referred to the RTW coordinator	Sum of training costs per worker and costs of time investment of the insurance physician, the labour expert, and the RTW coordinator (200+535)	735

Table 3. Total mean effects and costs and differences in mean total effects and costs during 12-month follow-up (where applicable pooled effects and costs are presented).

	Mean total effect (SD)		Mean effect difference (95% CI)
	Participatory RTW program (N=79)	**Usual care group (N=84)**	
Effects			
Days until sustainable RTW	199 (128)	227 (145)	-28 (-71; 14)
QALY (pooled)	0.63 (0.22)	0.58 (0.26)	0.05 (-0.04; 0.13)
Costs	**Mean total costs (SD)**		**Mean cost difference (95% CI)**
OHC by the SSA[1]	1904 (1856)	930 (1512)	975 (448; 1500)
Paid sickness benefit	6151 (5943)	4995 (6265)	1156 (-735; 3046)
Total SSA costs[2]	8056 (6413)	5925 (6486)	2131 (216; 4211)
Total primary care costs (pooled)	610 (884)	480 (696)	130 (-108; 384)
Total outpatient care costs (pooled)	382 (645)	384 (751)	-2 (-235; 196)
Informal care costs (pooled)	954 (1598)	834 (1802)	120 (-429; 614)
Medication costs (pooled)	186 (521)	238 (1102)	-52 (-484; 125)
Total health care costs[3] (pooled)	10189 (7055)	7862 (7394)	2327 (51; 4465)

[1] Calculated by adding participatory RTW program costs, OHC professional costs, and applied OHC interventions costs (this included the costs for placement in a temporary workplace in the intervention group).

[2] Calculated by adding sickness benefit costs and OHC costs.

[3] Calculated by adding total SSA costs, primary care costs, outpatient care costs, informal care costs, and medication costs.

Cost-effectiveness analyses

The cost-effectiveness analysis (CEA) from the social insurer's perspective showed an ICER of -76 for sustainable RTW, meaning that an additional 76 Euros was needed in the participatory RTW program group for one day earlier RTW, compared to care as usual. The cost-effectiveness plane (Figure 1a) shows that 89% of the bootstrap cost-effect pairs were located in the north-east quadrant, indicating that the participatory RTW program was more effective and associated with higher costs than usual care. The cost-effectiveness acceptability curve (Figure 1b) showed a 0.80 probability of the participatory RTW program being cost-effective compared to usual care if one is willing to pay 200 Euros for one day earlier RTW.

The CEA from a societal perspective differed slightly with an ICER of -82, meaning that an additional 82 Euros needs to be invested in the participatory RTW program to achieve one day earlier RTW, compared to care as usual. Additionally, the cost-effectiveness plane (Figure 2a) showed that 88% of the bootstrap cost-effect pairs were located in the north-east quadrant. The cost-effectiveness acceptability curve (Figure 2b) showed a 0.75 probability of the participatory RTW program being cost-effective compared to usual care if one is willing to pay 200 Euros for one day earlier RTW.

Cost-utility analyses

There was a small non-significant difference in QALYs gained over 12 months (0.05 on a scale of 0 to 1) in favour of the participatory RTW program group (Table 3), and the cost difference was 2327 Euros resulting in a large positive ICUR of 46,540 (2327 / 0.05). This means that 46,540 Euros needs to be invested in the participatory RTW program to gain one QALY per worker. Furthermore, the majority of the pooled cost-QALY pairs, i.e. 85%, were located in the north-east quadrant of the cost-utility plane (not shown) indicating that the new intervention was more effective and more costly, compared to care as usual.

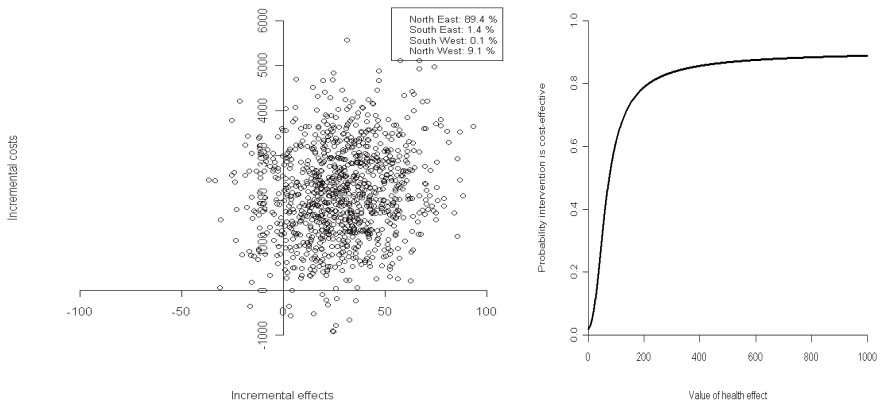

Figure 1a and 1b. Cost-effectiveness plane and cost-effectiveness acceptability curve for the difference in RTW after 12 months from social insurer's perspective.

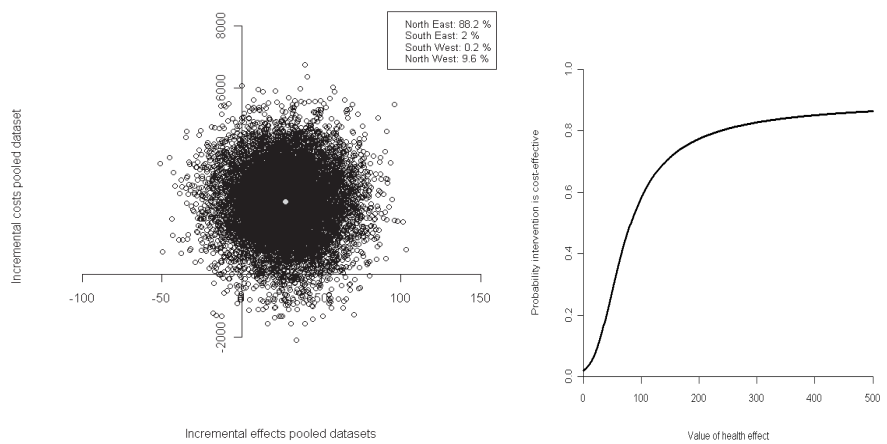

Figure 2a and 2b. Cost-effectiveness plane and cost-effectiveness acceptability curve for the difference in RTW after 12 months from societal perspective.

Cost-benefit analyses

The cost-benefit analyses from a societal perspective showed that the mean difference in total health care costs was 2327 Euros (95% CI €42 to €4465) in favour of the usual care group. The benefit (difference in productivity yield) was 4400 Euros (95% CI €1969 to €7499) per worker in favour of the participatory RTW program

group. The return-on-investment from a societal perspective was 89% ([€4400 - €2327 / €2327]*100); i.e. every Euro invested in the new intervention yielded 0.89 Euro profit. The net societal benefit of the participatory RTW program compared to care as usual was 2073 Euros (€4400 - €2327) per worker.

The results from the sensitivity cost-benefit analysis (assuming 75% productivity during work resumption with supportive sickness benefit) showed a monetary benefit of 3300 Euros (95% CI €1607- €5736) in favour of the participatory RTW program group and a net societal benefit, compared to care as usual, of 973 Euros (€3300 - €2327) per worker.

DISCUSSION

Main findings

The participatory RTW program was more effective, but also more costly than usual care. The total Social Security Agency costs (occupational health care and sickness benefit) and the total societal costs (all health care and sickness benefit) were statistically significantly higher in the participatory RTW program group. This was mainly due to higher costs associated with the new intervention. However, from a societal perspective, the new intervention resulted in a net economic benefit of 2073 Euros per worker, compared to care as usual.

Strengths of this study

In this study several main strengths can be identified. First, an important strength of this study was the pragmatic RCT design, i.e. the study was conducted in real-life Dutch occupational health care practice. Second, an important strength was the use of both the social insurer's and the societal perspective for the economic evaluation. Since the existence of the Dutch Social Security Agency is closely linked with, even embedded within, the Dutch Society and its Social Security system, monetizing the program costs from both perspectives provides the most comprehensive economic evaluation. Next, a third strength was the use of the Social Security Agency database for the collection of RTW data and sickness benefit data. And, subsequently, checking these data with other sources, namely (1) the client files at the Social Security Agency,

(2) the reports in the for this study newly developed computerized support system, and (3) the self-report questionnaires. Finally, a fourth strength in this study was the collection of the occupational health care costs. Two recent cost-effectiveness studies on participatory RTW interventions in the Netherlands did not register costs for work adaptations resulting from the consensus-based RTW plan.[21, 26] This may have resulted in an underestimation of RTW program costs. In our study we not only collected the costs for usual care in both groups, but we also registered the additional costs (based on real prices) for sociomedical guidance and applied interventions as part of the new participatory RTW program.

Limitations of this study

Several methodological limitations should be acknowledged. First, the use of retrospective questionnaires may have biased the data. A possible alternative could have been prospective data collection using cost diaries. However, we believe that the influence of recall bias may be limited since findings in the literature show that recall information for 3 months is valid.[27] Second, net cumulative working hours were used as a proxy for productivity. Reduced productivity during work resumption, i.e. so-called presenteeism,[28] was not measured in this study. However, evidence suggests that productivity may be decreased ranging from 5% to 16% as a result of production loss due to health problems.[29, 30] Nonetheless, we believe that overestimation of productivity in our study was limited. Offering the possibility of a gradual return-to-work with a stepwise increase of working hours (and a subsequent increase in productivity) was part of the new RTW program. Furthermore, to take into account the possibility of a reduced productivity after RTW, we performed a sensitivity analysis assuming 75% productivity during work resumption. In our opinion, in view of the aforementioned literature findings, this might be a conservative approach. Third, a limitation in our study was related to the relatively high degree of loss to follow-up for the self-reported questionnaires. Long-term follow-up is essential to critically evaluate the outcome of a newly developed intervention. However, it is known that loss of participants to follow-up can affect the final conclusions of an outcome study.[31] By incorporating the 29% participants with partial cost data in the analysis the results can be considered more robust. To limit the presence of

biased estimates of the self-reported health care utilization, we used the Multivariate Imputation by Chained Equations (MICE) methodology.[18] The MICE methodology assumes a normal distribution for each variable.[19, 32] Simulation studies showed that in general MICE performs well in non-normally distributed data.[32] Handling non-normally distributed continuous data, which is characteristic of cost data, can, however, require an alternative MICE procedure.[19] In our dataset we noticed that the highest cost values, which could be attributed to some workers who were sick-listed for a long time (cost drivers), were also used to impute the missing values. To prevent overestimation of group mean values we applied an alternative MICE procedure. Before the imputations started we replaced the cost values who were at the 90th percentile or higher, by their group mean. The strength of this procedure is that the imputation model is more or less corrected for patients with extreme high values, i.e. missing values are estimated by using data from all "normal" workers and not determined by workers who are responsible for the highest costs. This generated more plausible and representative cost data in our trial. A fourth limitation was the use of first RTW as outcome measure instead of full RTW, because the workers in our study had no own work to return to. However, earlier sustainable full RTW as a measure of successful removal of all RTW limitations could have increased the impact of our study findings. In addition, the use of full RTW as primary outcome measure could have made it easier to compare our results with similar studies who investigated participatory RTW interventions for other worker groups.[21, 26]

Finally, caution is needed when generalizing the results of this study to another context, e.g. to other countries. The participatory RTW program was specifically tailored for our study population and the Dutch context in which it was implemented. When using the participatory RTW program in a different setting, the population characteristics and the (social, political and cultural) context in which the program will be implemented and used need to be taken into account.

Comparison with other studies

The importance of applying RTW interventions closely linked to a workplace has been emphasized by several authors.[33, 34] In addition, RTW interventions focusing on consensus-based work-related adaptations, e.g. a change in working hours or

work design, with active involvement of important stakeholders can reduce work disability duration and associated costs.[34, 35] However, to our knowledge, cost-effectiveness studies investigating comparable RTW interventions on work-related outcomes for workers without (relative) permanent employment relationships are, to date, not available. Up to now, there are only a few available economic evaluations of participatory RTW interventions aimed at sick-listed regular employees.[21, 27, 36, 37] These studies showed that a participatory RTW intervention was cost-effective and cost-beneficial in sick-listed employees with (acute or chronic) low back pain.[21, 36, 37] For employees with stress-related mental disorders no overall cost-effectiveness was found,[26] but for the subgroup of employees with baseline intentions to RTW despite their symptoms, the workplace intervention was significantly more effective and less costly.

In this study the costs of the workplace intervention itself (training and additional time-investment by the occupational health care professionals) were in line with earlier developed participatory RTW interventions for sick-listed employees in the Netherlands.[21, 26] However, although the aforementioned studies also showed that, compared to care as usual, additional (direct) costs are needed to perform a participatory RTW intervention, application of the intervention in sick-listed employees with low back pain resulted in earlier RTW against substantial lower total health care costs, i.e. a substantial lower ICER was reported, in comparison with our study findings. A possible explanation for this is the fact that, in contrast to regular employees, in our study the sick-listed workers had no workplace to return to. To find suitable temporary workplaces vocational rehabilitation agencies were contracted and offered a financial reward for their services. In addition, as incentive for employers, the worker was placed in a temporary workplace with ongoing supportive benefit from the Social Security Agency. Hence, additional costs were needed to realize earlier RTW.

Study implications

Economic evaluations carried out alongside pragmatic randomised trials are increasingly common in occupational health care research because it is important to assess costs and cost-effectiveness apart from work-related and health-related

outcomes. Moreover, the results of these economic evaluations are essential to convince policymakers that implementation of a new RTW intervention is a worthwhile and necessary investment. In this study sustainable RTW was enhanced by making a consensus-based RTW action plan (with a key role for the independent RTW coordinator) and by offering the possibility of a suitable temporary workplace. From a societal perspective, the RTW program increased social participation of vulnerable workers, and generated a net economic benefit due to productivity gain. Hence, from a general perspective, implementation of the participatory RTW program may potentially enhance a productive contribution of vulnerable workers to the labour force. However, investments were on the part of the Social Security Agency (and thus from public money) and benefits were on the part of the employers. This division in costs and benefits will, very likely, make implementation more challenging. From this perspective, several possibilities should be taken into account. Firstly, it is important to emphasize the importance of using community money to enhance social participation of vulnerable working populations in order to increase their contribution to the labour market. In addition, given the international trend of an ageing workforce, there is a need for active labour market policies[38] in order to utilise and strengthen present and potential labour force sources. Moreover, within the framework of an active labour market policy, it may be possible to extend already existing Dutch arrangements for subsidised (temporary) workplaces for young disabled workers to other groups of vulnerable workers, e.g. sick-listed unemployed workers. By realising subsidised (temporary) workplaces costs and benefits can be shared between the Social Security Agency and the employers. Secondly, a potential solution could be to increase the responsibilities of employers with regard to facilitation of RTW of sick-listed workers without an employment contract. From this perspective, it can be recommended to asses the possibilities to make temporary agencies more responsible for RTW of sick-listed temporary agency workers, i.e. offering a suitable workplace for (therapeutic) RTW and having financial responsibilities with regard to vocational rehabilitation costs. Finally, creating a network of potential (temporary) workplaces and not having to contract commercially operating vocational rehabilitation agencies could reduce the costs for applying the new RTW program.

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CONCLUSIONS

The newly developed participatory RTW program for temporary agency workers and unemployed workers, sick-listed due to MSD, was more effective but also more costly, compared to care as usual. To gain one day earlier RTW by using the participatory RTW program approximately 80 Euros needed to be invested. However, from a societal perspective, there was a net monetary benefit after 12 months. Every Euro invested yielded a net profit of 0.89 Euro due to gain in productivity. In our opinion, implementation of the new RTW program might be a worthwhile investment as it has potential to achieve a sustainable and productive contribution of vulnerable workers to the labour force.

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