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PROTECTING AND PROMOTING MENTAL HEALTH OF NURSES IN THE HOSPITAL SETTING: IS IT COST-EFFECTIVE FROM AN EMPLOYER'S PERSPECTIVE?

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Abstract
Objectives: Nurses are at elevated risk of burnout, anxiety and depressive disorders, and may then become less productive. This begs the question if a preventive intervention in the work setting might be cost-saving from a business perspective. **Material and Methods:** A cost-benefit analysis was conducted to evaluate the balance between the costs of a preventive intervention among nurses at elevated risk of mental health complaints and the cost offsets stemming from improved productivity. This evaluation was conducted alongside a cluster-randomized trial in a Dutch academic hospital. The control condition consisted of screening without feedback and unrestricted access to usual care (N = 206). In the experimental condition screen-positive nurses received personalized feedback and referral to the occupational physician (N = 207). **Results:** Subtracting intervention costs from the cost offsets due to reduced absenteeism and presenteeism resulted in net-savings of 244 euros per nurse when only absenteeism is regarded, and 651 euros when presenteeism is also taken into account. This corresponds to a return-on-investment of 5 euros up to 11 euros for every euro invested. **Conclusions:** Within half a year, the cost of offering the preventive intervention was more than recouped. Offering the preventive intervention represents a favorable business case as seen from the employer's perspective.

Key words:
Cost benefit, Mental disorders, Nurses, Occupational health, Prevention, Work functioning

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INTRODUCTION

Some nurses are at elevated risk for stress and mental health problems due to high job demands and a lack of autonomy [1,2]. Poor mental health is undesirable in its own right, but it may also have financial implications for the employer [3,4] via absenteeism, presenteeism (reduced at-work job performance) and staff turnover [5,6]. From a business point of view, it might therefore be of value to protect and promote mental health of nurses and maintain the quality of their work.

Periodic screening could be useful to detect early signs of mental health complaints and personalized feedback could encourage help-seeking among nurses. A Workers' Health Surveillance (WHS) instrument was developed for this purpose. The WHS is a preventive strategy that aims at the early detection of negative health effects and work functioning problems and includes personalized feedback. The WHS is followed up by referral to the occupational physician (OP) for screen-positive nurses in need of intervention. This 3-tiered intervention aims to detect mental health problems in the earliest stages and prevent further deterioration of these problems. In so doing, the intervention may also enhance job performance [7,8].

Elsewhere, we published a cost-effectiveness analysis of the intervention from the societal perspective [9]. That study took account of the costs of health care uptake, pharmacy use and nurses' out-of-pocket expenses for travelling to health care services. The outcome of interest was the treatment response. It was concluded that screening, feedback and OP care led to improved work functioning and these were associated with a 75% likelihood of lower costs than a "do nothing" scenario, as seen from a societal perspective. However, an employer is likely to look at a different set of financial parameters to inform decisions about implementing an intervention in the work setting. This paper adopts the employer's perspective and assesses whether providing screening followed by personalized feedback and referral to the OP represents a viable business case.

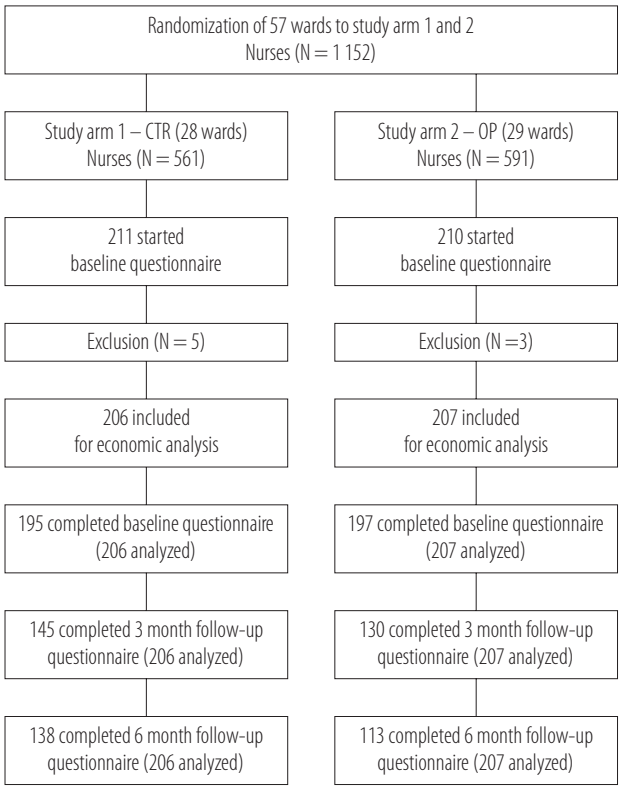
In contrast to the aforementioned cost-effectiveness analysis, we now look at the costs that are incurred by the employer of offering the preventive intervention. These costs are then compared with the benefits (expressed in euro (€)) that are, again, relevant from the employer's perspective, such as the cost differences stemming from reduced absenteeism and improved productivity while at work. In short, this paper is conducted as a cost-benefit analysis to address the question if the benefits outweigh the costs. If this were the case, then the net-benefits would be suggestive of a favorable business case that may persuade employers to implement the preventive WHS intervention in the work setting.

MATERIAL AND METHODS

Study design

The study was conducted in an academic medical centre in the Netherlands as a pragmatic cluster randomized controlled trial with randomization at the level of hospital wards. A cost-benefit analysis was conducted from the employer's perspective to see if there is a business case for investing in the employees' mental health and work functioning. All costs were calculated in Euro for the reference year 2011 using the consumer price index from Statistics Netherlands [10]. For the current cost-benefit analysis, we compared 2 conditions: 1) the OP condition (screening, feedback followed by referral to the OP for the screen positives), vs. 2) the control (CTR) condition (screening without feedback and without referral to the OP).

Within the hospital, 29 wards (with 207 consenting nurses) were randomized to the OP condition and 28 wards (with 206 consenting nurses) to the CTR condition. The data was collected at baseline and after 3 and 6 months (henceforth t_0, t_1 and t_2). Both costs and benefits were computed over a 6-month time horizon, corresponding to the follow-up period of the study. We excluded healthcare costs (other than those attributable to the intervention) and nurses' out-of-pocket costs for obtaining health care



CTR – control; OP – occupational physician.

Fig. 1. Flow-chart of participants throughout the study

because they were deemed not to be relevant from the employer's perspective. Costs and benefits were not discounted because the follow-up time did not exceed 1 year. A medical ethics committee approved the study. The Figure 1 presents the flow of participants through the trial. More information regarding the design of the Mental Vitality @ Work study may be obtained elsewhere [11].

Intervention and control conditions

All participants were screened for work functioning impairments and 6 types of mental health complaints: distress, work-related fatigue, risky drinking, depression, anxiety, and post-traumatic stress disorder. Nurses in the CTR condition filled out the screening questionnaire and no further steps were taken. In the OP condition, screening was followed by personalized feedback and screen-positive nurses received an invitation to visit the occupational physician. The subsequent OP consultation was structured according to a 7-step protocol, with the focus on identifying impairments in work functioning and providing advice on how to improve wellbeing and work functioning. The 7-step protocol included the following:

- discussing expectations;
- discussing screening results and characteristics of work functioning and mental health complaints;
- discussing possible causes in the private, work, and health condition and consequences for work functioning;
- identifying the problem and offering rationale;
- giving advice on how to tackle the health complaints, how to improve work functioning, how to prevent consequences of impaired work functioning, and how to communicate with the supervisor about work functioning and mental health;
- discussing possible follow-up or referral to other care providers;
- summarizing the consultation.

All participating OPs received 3-hour training in using the protocol [12].

Computation of intervention costs

The costs of offering the intervention included:

- the costs of operating the web-based screening and feedback module,
- the costs for periodically upgrading the module,
- the costs of hosting the module on a server (including maintenance costs).

These costs amounted to 4 euros per user (calculations may be obtained from the 1st author). Furthermore, the per-participant costs for consulting the OP (73 euros) and the costs for the OP-assistant for scheduling the nurses' visits to the OP (3 euros) are also included. To these we added the costs of training the OPs in using the preventive consultation protocol (50 euros per OP visit). Thus,

a nurse who engaged in screening, received feedback and made a single visit to the OP would generate costs in the amount of 130 euros. However, it needs to be borne in mind that some screen-positive nurses did not visit their OP, while others made a single visit or multiple visits.

Computation of the benefits

As seen from the employer's perspective, the benefits from the intervention are related to the increased productivity levels due to the reduced absenteeism and presenteeism. Changes in productivity were valued in monetary terms, using the human capital method. This method assesses the loss of productivity by multiplying the self-reported number of working days lost due to absenteeism multiplied by the average gross gender and age specific wages per paid employee. The wage was estimated according to the Dutch guideline for health economic evaluation and it may be found in the Table 1 [13–15].

The work days lost due to diminished productivity were based on the self-reported number of work days when the nurse did not feel well while at work over the past 6 months, weighted by an inefficiency score derived from the Productivity and Disease Questionnaire (PRODISQ) [16]. This was done on a 10-point rating scale, ranging from 0 to 1, with 0 meaning not inefficient and 1 completely inefficient. The number of work days lost due to inefficiency was then multiplied with gender and age-specific wages indexed for the year 2011 [10,15]. Finally, the benefits were computed by comparing the pre-intervention costs (at t_0) with those post intervention (at t_2). This yielded a pre-post cost difference in each condition and these could then be compared across the conditions.

Table 1. Productivity in study groups

Age [years]	Productivity [euro]	
	men	women
15–19	9.88	8.97
20–24	18.18	17.59
25–29	24.77	24.19
30–34	30.37	28.20
35–39	34.85	29.96
40–44	37.25	29.76
45–49	39.25	29.61
50–54	40.00	29.96
55–59	40.33	30.21
60–65	40.07	29.36

Cost-benefit analysis

All analyses were performed in agreement with the intention-to-treat principle, thus including all participants as randomized. In the main analysis, the missing data was replaced by their most likely value under the expectation maximization (EM) algorithm in the Statistical Package for the Social Sciences (SPSS) 19.

The incremental costs, C, were the intervention costs of the OP condition minus the intervention costs of the CTR condition. The incremental benefits, B, were computed as the cost savings due to the reduced productivity losses (owing to pre-post changes in both absenteeism and presenteeism) in the OP condition minus the cost savings in the CTR condition. Net-benefits were computed as B−C, the cost-to-benefit ratio as C/B and the return on investment (ROI) as B/C.

The net benefits, cost-to-benefit ratio and return on investment were analyzed in Stata (version 12.1) using non-parametric bootstrap techniques. The analyses took into account that observations were clustered, as nurses were "nested" in different wards at the hospital. Therefore, the robust sample errors were obtained using the 1st-order Taylor series linearization within each of the 1000 bootstrap steps. This procedure was conducted on the dataset that was imputed using EM.

Sensitivity analysis

Sensitivity analyses were conducted to assess the robustness of our findings by making less optimistic assumptions

about the benefits. In this context it is of note that the benefits due to reduced presenteeism were computed by multiplying the inefficiency score by the number of days at work with diminished work productivity. However, it may be assumed that presenteeism may not have any impact on productivity levels when the diminished productivity is compensated for during normal working hours by the nurse or by colleagues [17]. If that is true, then we may have produced an overly optimistic estimate of the benefits. Thus, to test the robustness of our findings, we recomputed the cost benefit ratio by reducing the benefits by 10%, 20% and 30%, and by omitting the cost offsets of reduced presenteeism altogether.

RESULTS

Sample characteristics

Baseline characteristics of the groups are shown in the Table 2. Both groups were quite similar, regarding demographic and occupational characteristics. The majority of the participants were female nurses born in the Netherlands, who lived together with a partner. On average the participants were aged 42 years and had more than 10 years of work experience. We concluded that randomization resulted in a balanced trial.

Cost-benefit analysis

The Table 3 presents the per-nurse intervention costs and benefits in the OP and the control condition as well as the net-benefits.

The mean per-nurse intervention costs amounted to 89 euros in the OP condition and 25 euros in the CTR condition. The cost difference between the conditions was therefore 64 euros (95% CI: 52–76), which was statistically significant (robust bootstrapped SE = 6.03, $Z = 10.5$, $p < 0.001$).

Cost reductions due to greater productivity were 715 euros (95% CI: 226–1203) in the OP condition relative to

Table 2. Baseline characteristics of the study groups

Characteristic	Respondents	
	CTR group (N = 206)	OP group (N = 207)
Age [years] (M±SD)	41.83±11.3	42.56±11.4
Females [n (%)]	159 (77.2)	170 (82.1)
Function [n (%)]		
nurse	146 (70.9)	124 (59.9)
surgical nurse	9 (4.4)	14 (6.8)
nurse practitioner	23 (11.2)	14 (6.8)
allied health professional	21 (10.2)	31 (15.0)
anesthetic nurse	0 (0.0)	13 (6.3)
other	7 (3.4)	11 (5.3)
Working hours (M±SD)	30.98±6	28.73±8.1
Living with a partner [n (%)]	154 (74.8)	153 (73.9)
Born in the Netherlands [n (%)]	176 (85.4)	167 (80.7)
Work experience [years] (M±SD)	11.3±10.1	12.53±10.4
Turnover intention [n (%)]	22 (10.7)	27 (13.0)

M – mean; SD – standard deviation. Other abbreviations as in Figure 1.

Table 3. Intervention costs, benefits and net-benefits in study groups

Variable	OP group [euro/nurse]	CTR group [euro/nurse]	DIFF (OP–CTR) [euro/nurse]
Intervention costs			
screening	4	4	0
added costs OP training	50	0	50
OP care t_0	13	6	7
OP care t_1	17	7	10
OP care t_2	5	7	–3
total	89	25	64
Benefits			
absenteeism t_0	660	492	
absenteeism t_2	234	374	
averted absenteeism cost	426	118	308
presenteeism t_0	1 125	1 069	
presenteeism t_2	916	1 267	
averted presenteeism cost	209	–198	407
total	635	–80	715
Net benefits			
presenteeism included	546	–105	651
presenteeism excluded	337	93	244

DIFF (OP–CTR) – difference (occupational physician group minus control group).
Other abbreviations as in Figure 1.

those in the CTR condition. These cost savings were statistically significant (robust bootstrapped SE = 249, Z = 2.87, p = 0.004) and in favor of the OP condition.

Subtracting per-participant intervention costs from the per-participant cost offsets due to reduced absenteeism and presenteeism resulted in net-savings of 651 euros per nurse. The net-benefits were statistically significant (95% CI: 167–1135, SE = 247.13, Z = 2.63, p = 0.008) and in favor of the OP condition. The benefits stemming from the reduced presenteeism are hard-to-quantify, by excluding these benefits and focusing on net-benefits when only absenteeism is regarded, resulted in net-benefits of 244 euros per nurse in favor of the OP condition, still representing a favorable business case as seen from the employer's perspective.

Base-case and sensitivity analyses

In the base-case analysis the return on investment for the OP condition was 7 euros per 1 invested euro and –3 euro per 1 invested euro for the CTR condition (i.e., negative benefits, thus higher costs). The return on investment was (715/64 euro =) 11 euros per 1 invested euro (Table 4).

Various sensitivity analyses were performed to attest the robustness of the findings and the results are summarized in the Table 4. The results of the sensitivity analyses attest to the robustness of the main analysis. The incremental costs of offering the intervention are more than compensated for by productivity gains. Even when productivity gains in the OP-condition are lowered by 30% the net benefit per employee is still 461 euros after 6 months and

Table 4. Base-case and sensitivity analyses

Variable	OP group [euro]	CTR group [euro]	DIFF (OP–CTR) [euro]	Net-benefits (B–C) [euro]	Cost-benefit ratio (C/B) [euro]	Return on investment (B/C) [euro]
Base-case						
costs (C)	89	25	64			
benefits (B)	635	–80	715	651	0.09	11
Sensitivity analysis						
–10% OP benefit	571	–80	651	587	0.11	10
–20% OP benefit	508	–80	588	524	0.11	9
–30% OP benefit	444	–80	525	461	0.12	8
–presenteeism	426	118	308	244	0.21	5

Abbreviations as in Figure 1.

the return-on-investment is still a substantial 8 euros per 1 invested euro. When ignoring the hard-to-quantify benefits stemming from reduced presenteeism, there still is a return on investment of almost 5 euros.

DISCUSSION

Main findings

The primary aim of the study was to conduct a cost-benefit analysis from the employer's perspective by considering the balance of the costs of a preventive intervention and the cost offsets stemming from improved productivity. Net-benefits were 651 euros per nurse and were statistically significant at $p = 0.008$. In other words, the payout is 11 euros per one euro invested. It is worth noting that the cost offsets occur within 6 months post intervention, thus representing a favorable business case from an employer's perspective where the initial investments are more than recouped within a short period of time. The main conclusion that offering the intervention offers good value for money from the employer's perspective remains intact when confining the analysis to the changes in absenteeism and ignoring any benefits due to reduced presenteeism.

Placing the results in the wider context of the literature

There are only a few studies evaluating the costs and benefits of mental health promotion and prevention in the workplace. Knapp et al. have assessed the economic impact of mental health and well-being improvements associated with various programmes based on a limited range of studies using economic modeling [18]. Arends et al. evaluated a return-to-work intervention and focused on the prevention of recurrent sickness absence and helping workers to stay at work. The authors demonstrated the 12-months effectiveness of a problem-solving intervention for reducing recurrent sickness absence in workers with common mental disorders [19]. Iijima et al. conducted a cost benefit analysis of mental health prevention programmes within Japanese workplaces. They concluded that the majority of companies gained a net benefit from the mental health prevention programmes [20]. Another Japanese study concluded that a participatory work environment improvement programme and individual-oriented stress management programmes showed better cost-benefits, suggesting primary prevention programmes for mental health at the workplace economically advantage employers [21].

Although the results of our study unite with the results of the previously conducted studies which took place during and after the sickness absence period, or within another cultural, ethical and geographical setting, our study might be seen as a welcome addition to a limited evidence-base.

Strengths and limitations

Several strengths of this study need to be mentioned. Firstly, this study was a trial-based economic evaluation and is therefore firmly rooted in empirical data. Secondly, the study was conducted as a pragmatic trial, thus enhancing the ecological validity of the results [22]. Thirdly, we reviewed both the cost reductions due to less absenteeism and reduced presenteeism. Although including presenteeism is a standard practice in economic evaluations, it is worth mentioning that owing to their lower visibility, these costs are not so evident to an employer and are often overlooked [13,23].

The results need to be placed in the context of the study's limitations. Firstly, the trial data was affected by drop-out and this may have distorted the outcomes. That said, we conducted an intention-to-treat analysis by imputing missing observations under the EM algorithm. In our health economic evaluation of the same data we demonstrated that the results after the EM imputation are very similar to those obtained under alternative imputation strategies such as regression imputation and last-observation-carried-forward imputation. Nonetheless, drop-out rates were substantial and may have biased our outcomes.

Secondly, all outcomes were based on self-report. However, it is hard to see how the presenteeism may be measured without resorting to self-assessments of diminished productivity. Unfortunately, the validity of the self-reported presenteeism has not often been researched [24–28]. It is precisely for this reason that we conducted sensitivity analyses to gauge the robustness of the study's outcomes when less optimistic assumptions are being made about the benefits in the OP condition.

Thirdly, some potential impacts of the intervention were not assessed, such as the costs of staff turnover and the spill-over effects of absenteeism by 1 nurse on the workload of her colleagues. As to staff turnover, the data indicate that turnover intention was reduced from 27 nurses at t_0 down to 10 nurses at t_2 in the OP condition. In the CTR condition these were 22 and 14, respectively. This data suggests that the OP intervention may have additional favorable effects on staff turnover, but these were not quantifiable in terms of actual changes in staff turnover. As a consequence, we may now only speculate that the cost benefits that we reported represent lower bounds of the true cost benefits.

Fourthly, it should be noted that all intervention costs are computed for. Thus the initial investments required for developing and implementing the interventions were part of our study. Although this might contradict with guidelines for economic evaluations [29], where one would solely account for intervention costs when fully implementing the intervention, we recognized that the costs required for developing and implementing the interventions were interesting in their own right and therefore included in the total intervention costs.

Fifthly, there are 2 main approaches to cost-productivity losses; the human capital approach and the friction cost approach. However, both approaches produce similar results in the short term, as is the case in our study with a follow-up after 6 months. We therefore expect that choosing one approach or the other is unlikely to have a major impact on our conclusions. From a business case point of view, the relatively short follow-up time is not a limitation, because it is easy to see that the costs of offering the intervention are recouped within such a short time span. Nevertheless, as yet we do not have data concerning the longer-term outcomes.

CONCLUSIONS

A return-on-investment of 11 euros within 6 months represents a very appealing business case, and wider implementation of the intervention may be recommended.

However, and as noted above, the time horizon of this study is limited, so that we only look at costs and cost reductions over a 6-month period. Therefore, we do not know if effects are maintained over time. In all likelihood, the intervention's impact will need to be sustained by periodic repetition of the intervention, e.g., a screening plus personalized feedback plus referral to the OP for screen-positives every 12 or 24 months.

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