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Research Article

Sick-leave Program after Myocardial Infarction

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Abstract

Aim: This study aims to compare the cost-effectiveness of a structured sick-leave program to usual care sick leave management in patients after an uncomplicated myocardial infarction. **Methods:** One hundred and forty-three patients admitted to Oslo University Hospital with an acute uncomplicated myocardial infarction were included in the study and randomized into either the intervention group or the conventional care group. The intervention group received a structured program with full-time sick leave for two weeks after discharge, followed by an individualized return-to-work plan. The conventional group received no special follow-up regarding sick leave. The study assessed sick-leave duration, quality of life using the UBQ-H and SF-36 questionnaires and calculated the incremental cost per quality-adjusted life year (QALY) saved. **Results:** The structuralized sick-leave program led to significantly fewer days absent from work compared to conventional care. There were no significant differences in quality of life between the study groups. The incremental net savings of -$797 per patient in the intervention group were significantly higher ($p<0.001$), suggesting a potential impact on overall health costs. **Conclusion:** The study highlights the potential benefits of implementing a structured sick-leave program in reducing healthcare costs without negatively affecting patients' quality of life and 1-year outcome. However, the study's limitations, including a small sample size and short follow-up period, call for further investigation with larger cohorts and longer-term assessment. Implementing structured sick leave programs could have a substantial economic impact and improve outcomes for patients after myocardial infarction.

Keywords: Myocardial infarction; Health economy; Sick leave

Introduction

The prevalence of cardiovascular disease is high and poses a great economic burden in many countries [1,2]. With current treatment options for patients with myocardial infarction, such as percutaneous coronary intervention, patients are usually revascularized quickly and mobilized during the first few days after the event [3-5].

Conventionally, less research effort has been placed into optimizing the follow-up procedure after an acute myocardial infarction, compared to research into direct treatment of the event [6]. Nevertheless, recent studies have shown that a structured follow-up can be beneficial for patients' quality of life after myocardial infarctions [7-9].

Short and long-term absence from work after an acute myocardial infarction is associated with substantial costs for the society [2,10,11]. It is also speculated that a long absence makes it more difficult for the patient to return to work [2,11-13].

In this paper, we aim at comparing the cost-effectiveness of a structuralized sick-leave program to usual care sick leave management in patients after an acute myocardial infarction.

Methods

Participants and Randomization

One hundred and forty-three patients who were admitted to Oslo University Hospital due to an acute myocardial infarction were included in the study [8]. All patients were assessed against the inclusion/exclusion criteria (Table 1). Patients were randomized either into the intervention group or to conventional care group.

Randomization was performed by means of simple randomization by random allocation to study groups after each inclusion [14]. The random allocation was performed by drawing a numbered ticket, were the number corresponded to one of the two study groups. The number of tickets that were prepared for the study was set after calculating sample size and ensured balanced randomization between the study groups.

Criteria	Inclusion	Exclusion
Age	<65	>65
Employment	Regular, full-time	• None / Sporadic • Professional drivers
Complications from AMI		• Heart failure • Malignant arrhythmia • Major bleeding • Coronary artery by- pass surgery
Retirement age is usually 67 years in Norway		

Table 1: Inclusion/Exclusion criteria.

Sample size calculations showed that about 50 patients per study groups would allow 80% power for detecting a clinically significant difference in each of the SF-36 health domains with P = 0.05 [15,16]. A total of 100 patients would also offer greater than 80% power to detect a clinically worthwhile 0.1 ±0.2 SD difference in utility scores on the UBQ-H questionnaire [17]. In order to cover for patients lost to follow-up it was decided to include about 120 patients in the study.

ClinicalTrials.gov Identifier: NCT01108653

Study Groups

Patients randomized to the intervention group were given a structuralized program with full- time sick leave for 2 weeks after discharge. They were also given a telephone number to a cardiologist at the department of cardiology, available for support and questions during office time. After the initial two-week sick leave, the patients were encouraged to return to work full-time or part-time according to an individual adaptation. The general practitioner of the patients was also instructed to help the patients to go back to work as soon as possible.

All patients were transferred back to their local hospitals after potential PCI therapy at Oslo University Hospital. The conventional group was then sick listed according to the discharging doctor's assessment and received no special follow-up or advice on when to return to work.

The study was approved by the ethical committee of Oslo University and all the patients signed an informed consent Outcome measures

Sick-leave duration

The length of every patient's absence from work was recorded at the 12-month control. The duration of sick leave was calculated from the day of discharge from the hospital to the first day back to paid work.

Quality of life

Quality of life measures were performed at baseline and at 12 months using the Utility- Based Quality of Life – Heart (UBQ-H), and the Medical Outcomes Study Short Form-36 (SF36), and questionnaires.

The SF-36 from the RAND Corporation is a well-established survey of patient health, both physical and mental, and is validated for the use in monitoring and assessing care outcomes in adult patients. The SF-36 guides suggest that a difference of 10 points between groups per domain indicates a clinically significant difference [15,16].

The UBQ-H was developed specifically for use in coronary artery disease. Components of UBQ-H include physical, psychological and social measures. It also includes three summary measures of quality of life; a time trade-off item, a rating scale and an ordinal health assessment item [17].

Incremental cost per QALY saved

Incremental cost per QALY saved was calculated as an incremental (structuralized sick leave vs conventional sick leave) cost per patient divided by the incremental QALYs per patient [18].

Statistical analysis

In this study 143 patients were included to cover for patients lost to follow-up. Statistical analysis was performed using the SPSS Statistics 26 software. Data was tested for normality using Kolmogorov–Smirnov test. Unpaired t tests, χ^2 tests and Mann–Whitney U tests for non-normal data were used for comparisons between groups. Statistical significance was inferred when $P<0.05$. All results are presented unadjusted for multiple comparisons.

Results

Study population and characteristics

In total, 143 patients were included in the study. However, 17 were lost to follow up, of which 13 patients did not show up for scheduled control despite attempts to contact the patients by phone and mail, and four were excluded due to concurrent medical reasons, such as cancer and debilitating injury.

All baseline characteristics were well balanced between the study groups (Table 2). Of the 143 patients who entered the study, 98 (68.5%) had an index diagnosis of NSTEMI, while 45 (31.5%) had an index diagnosis of STEMI. Furthermore, 140 (97.9%) patients underwent PCI as primary treatment, while 3 (2.1%) patients had received intravenous thrombolytic therapy as primary treatment. In addition, 41 (28.7%) patients had a previous history of AMI or PCI.

Characteristics	Conventional (n=71)	Intervention (n=72)
Physical characteristics		
Sex (M:F)	38:33	37:35
Age	54.0	54.1
Clinical details on index admission, n (%)		
Index diagnosis (NSTEMI:STEMI)	48:23	50:22
Prior AMI or PCI	19	21
Coronary risk factors*, n (%)		
Family history for coronary artery disease	18 (25.2%)	23 (31.9%)
Hypercholesterolemia	32 (44.8%)	34 (46.9%)
Hypertension	30 (42%)	32 (44.6%)
Current smoker	15 (21%)	14 (19.3%)
Diabetes Mellitus	12 (17.8%)	11 (15.1%)
Obesity	21 (29.4%)	24 (33.1%)
Medication at discharge from primary hospitalization, n (%)		
Dual antiplatelet therapy	71 (100%)	72 (100%)
Antiarrhythmic agent	8 (11.2%)	10 (11%)
β-blocker	69 (96.6%)	71 (97.9%)
ACE-I	27 (37.8%)	29 (40%)
Diuretic	11 (15.5%)	10 (13.8%)
Insulin	7 (9.8%)	4 (5.5%)
Oral hypoglycemic agent	6 (8.5%)	6 (8.2%)
Statin	71 (100%)	72 (100%)

M: Male; F: Female; AMI: Acute Myocardial Infarction; PCI: Percutaneous Coronary Intervention; ACE-I: angiotensin-converting-enzyme inhibitors. *Family history of coronary artery disease: First-degree relative aged <60 years with an acute coronary event; hypercholesterolemia: total cholesterol level, 5.0 mmol/L; hypertension: blood pressure, 140/90 mmHg; diabetes: fasting plasma glucose level, 7.8 mmol/L; obesity: body mass index, >730 $kg \cdot m^{-2}$). All patient data were collected upon discharge from primary hospitalization.

Table 2: Baseline characteristics.

Absence from work results

The whole study group had a mean of 18.8 (CI 95% 17.9-19.7) days absent from work. The conventional group had a mean of 20.4 (CI 95% 18.9-21.8) days absent from work, while the number for the structuralized group was significantly lower, with a mean of 17.2 (CI 95% 16.2-18.2) days absent from work. A two-sample t-test gives an estimated p-value < 0.001, making the difference in absence between the two groups statistically significant.

Quality of life results and quality-adjusted life years

Results at baseline (intervention vs control group) of quality of life using the UBQ-H questionnaire were not statistically different (0.9576 and 0.9587, respectively; P=0.45 for difference between trial arms). Utility measures increased relative to baseline in both treatment arms over 12 months. At 12-months there was a non-significant improvement from baseline in both groups with 0.012 (CI 95%, 0.001-0.024) in the intervention group, and 0.010 (CI 95%, -0.001-0.022) in the control group. The difference between improvements in the study groups was not significant (p=0.36).

At baseline the difference in SF-36 results between the two groups was not significant when assessing general health (p=0,226). The conventional group scored 58.1 in the questionnaire, while the intervention group scored 59.5. After 12 months the results improved for both groups, although only marginally (p=0.254) (Table 3).

Quality of Life measure (SF36)	Conventional (n=62)		Intervention (n=64)		Comparison between study groups (Two-sample T-test) p- value	
	Baseline	12 months	Baseline	12 months	Baseline	12 months
Physical functioning	69.8	72.6	70.5	75.4	0.64	0.15
Limitations due to physical health	49.2	56.1	49.6	57	0.92	0.83
Limitations due to emotional problems	57.6	59.2	60.5	62.6	0.53	0.44
Vitality	53.3	54.4	52.7	53.9	0.8	0.84
Mental health	68.1	67.9	67.6	68.1	0.761	0.903
Social functioning	71.5	73.4	70.7	72.8	0.7	0.792
Bodily pain	73.3	75.2	72.7	74.9	0.737	0.897
General health	58.1	59.5	60.5	61.7	0.226	0.254

Table 3: Quality of Life-SF36 Questionnaire-Mean results for conventional and interventional groups.

Using utility estimates for the intervention group at 12 months applied to the base risk mortality of 5.3% after an acute myocardial infarction, the estimated gain in QALYs was 11.364 per 1000 up to 12 months [19,20].

Resource use and estimated cost-effectiveness ratio

Overall costs for both groups are shown in Table 4. The costs per patient for the in-hospital treatment of AMI were the same for both groups and based on previously published cost analysis for the treatment of AMI in Norway [21]. Furthermore, sick-leave costs were calculated using a cost of $250 per day absent from work per patient, as this represents the mean sick-leave cost per day in the Norwegian workforce, based on figures from the Norwegian Labour and Welfare Organization (NAV) [22]. This estimated a sick leave cost of $5100 per patient in the conventional group, an $4300 per patient in the intervention group. This was partly offset by a somewhat higher estimated resource use for the intervention group with an incremental cost of $25 per patients for anticipated telephone consultations, and an incremental net savings on re-admissions of -$22 (Table 4). Overall, the incremental net savings per patients in the intervention group was significantly higher with an amount of -$797 (p<0.0001). The incremental cost effectiveness ratio for intervention relative to conventional care was estimated at -$70 134 per QALY saved in the study population.

Health Resource	Mean cost per patient conventional	Mean cost per patient intervention	Incremental cost (Intervention- Conventional)
Health care costs*	$19500	$19500	$0
Sick leave costs†	$5100	$4300	-$800
Readmissions‡	$105	$83	-$22
Follow-up costs§	$0	$25	$25
Mean total cost per patient††	$24705	$23908	-$797

*Average health care cost for in-hospital treatment of AMI in Norway [23]; †Calculated an average cost of $250 / per day on sick leave; ‡Costs of readmissions per group divided by the number in the group; §Telephone consultations 15 min, cost estimate based on time use; ††Does not account for overall productivity gain by reducing sick leave

Table 4: Costs per patient.

Readmissions and telephone use

During follow-up, 9 patients from the intervention group and 12 patients from the conventional group required readmission on a total of 36 occasions. The total number of readmissions was not significantly higher for the conventional group (20 v 16; p=0.50).

Also, 10 patients (16 %) from the intervention group called the cardiologist or nurse a total of 16 times. 69% (n=11) of these calls occurred within the first week after discharge from the hospital.

Discussion

This study is among the first to assess the cost-effectiveness of a structured sick leave program for a selected group of patients after an uncomplicated myocardial infarction. We show that a structuralized sick-leave program has an effect in decreasing the number of days absent from work, without affecting the quality of life negatively [8]. Furthermore, there was no significant difference in the number of readmissions. Patients who were randomized to the intervention group were on average 3.2 days shorter absent from work than patients in the control group. Also, an incremental net saved cost of $797 per patient suggests that implementing a structured sick leave program could have a significant impact on overall health costs.

Moreover, Strømberg, et al showed in their 2017 study that the cost of health-related absenteeism can exceed the employees wage through loss of production, expenses for temporary workers and so on [23]. Thus, the true saved cost is likely higher when we consider the society, a conjecture also previously explored by Goetzel, et al. [24]. Also, this intervention and our analysis illuminates only the saved cost from reduced sick leave during the first year after the myocardial infarction and is in that respect a cost-effective measure with no observed negative effect on quality of life. However, it is difficult to estimate long-term effect of this initiative, as it would require a longer follow-up time.

Our results fall in line with previously published results from a cardiac rehabilitation program, where early return to work after an uncomplicated myocardial infarction was found to be favorable due to saved costs and better quality of life [25]. Furthermore, the amount of time absent from work after a myocardial infarction varies greatly in Europe and North America [2,7,9]. Our study shows that implementing a structured sick-leave program is an effective method to reduce overall healthcare costs. As the frequency of ischemic coronary disease is high in large areas of the world, these results are applicable to many countries.

In Europe in 2017 it was estimated that approximately 80 million people had cardiovascular disease that caused a productivity loss of €54 billion [26]. If one estimates that 5% of this population would be eligible for a structured sick leave program that reduces the number of days absent from work by 3 days, it will give a yearly saved cost of 12 million workdays in Europe alone. Hence, the economic benefits are high.

By addressing the needs of individuals with ischemic coronary disease, this study shows the potential to improve productivity, decrease absenteeism, and enhance overall well-being on a significant scale through simple structured interventions. These findings highlight the broader societal impact and benefits of adopting such a program in multiple countries worldwide.

The major limitations of our study included the relatively small sample size and lack in continuity in the inclusion and follow-up of the patients. The small sample size is likely to have limited the ability to detect reliably smaller, yet possibly still clinically important, changes that may exist in quality of life. It is also important to note that our findings apply to a select group of patients under the age of 65, without any form of post-MI complications.

The findings of our study strengthen the case for a structured sick leave program to all patients after acute coronary syndrome. However, the limitations in the study warrants further investigation into this field, including larger cohorts and longer follow-up.

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