Employment status three years after percutaneous coronary intervention and predictors for being employed. A nationwide prospective cohort study.

Siv J. S. Olsen[1,2], Henrik Schirmer[2, 3, 4], Tom Wilsgaard[5], Kaare H. Bønaa [5,6,7] Tove A. Hanssen [2, 8,9]

[1] Division of Internal Medicine, University Hospital of North Norway, Harstad, Norway.

[2] Cardiovascular Research Group, Institute of Clinical Medicine, The Arctic University of Norway, Tromsø, Norway.

[3] Akershus University Hospital, Lørenskog, Norway

[4] Institute of Clinical Medicine, University of Oslo, Norway

[5] Department of Community Medicine, The Arctic University of Norway, Tromsø, Norway.

[6] Department of Circulation and Medical Imaging, Norwegian University of Science and Technology, Trondheim, Norway.

[7] Clinic for Heart Disease, St. Olavs University Hospital, Trondheim, Norway.

[8] Department of Heart Disease, University Hospital of North Norway, Tromsø, Norway.

[9]Department of Health and Care Science, UiT - The Artic University of Norway, Tromsø, Norway

Corresponding Author

Siv J. S. Olsen

Division of Internal Medicine

University Hospital of North Norway

9480 Harstad

Norway

e-mail: siv.jorunn.olsen@unn.no

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Abstract

Background: Vocational support is recommended for patients in cardiac rehabilitation (CR), as returning to work is important in patients' social readjusting after an acute coronary event. Information is lacking whether CR leads to higher long-term employment after percutaneous coronary intervention (PCI).

Aims: The aims of this study were to determine employment status three years after percutaneous coronary intervention, to compare employment status between CR participants and CR non-participants and to assess predictors for employment.

Methods: We included first-time PCI patients from the NorStent trial, who were of working age (<63 years; n=2488) at a three-year follow-up. Employment status and CR participation were assessed using a self-report questionnaire. Propensity score method was used in comparing employment status of CR participants and CR non-participants.

Results: Seventy per cent of participants who were <60 years of age at the index event were employed at follow-up and CR participation had no effect on employment status. Being male, living with a partner, and attaining higher levels of education were associated with a higher chance of being employed, while being older, prior cardiovascular morbidity, and smoking status were associated with lower chance of being employed at follow-up.

Conclusion: Because a significant number of working-age coronary heart disease patients are unemployed three years after coronary revascularization, updated incentives should be implemented to promote vocational support. Such programmes should focus on females, patients lacking higher education and patients who are living alone, as they are more likely to remain unemployed.

Keywords: Return to work, employment status, vocational status, Norwegian Coronary Stent Trial, secondary prevention, coronary heart disease

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Introduction

Cardiac rehabilitation (CR) is a recommended aftercare for patients with established coronary heart disease (CHD).[1, 2] Return to work was one of the main outcomes in the early eras of CR and vocational support is still an important aspect of contemporary CR. Additionally, risk-factor management, exercise training, nutritional counselling, and psychosocial support are integral parts of CR.[3, 4] Systematic reviews indicate that CR may reduce cardiac mortality, hospital admissions, symptoms of anxiety and depression, and increase the quality of life, although there is no strong evidence of these benefits.[5-7] Recently, a Cochrane review that examined interventions to support return to work for people with CHD concluded, with a low-certainty of evidence, that comprehensive CR may promote return to work within the first six months following CHD. There were little to no evidence that CR promote return to work between six months and up to one year after a CHD event, and no evidence that CR promote return to work after one year of follow up.[8] Despite that return to work plays an important part in social readjustment after an acute coronary event, and has important implications for both the individual and the society, the knowledge on long-term effect of CR on employment status is scarce.[8] In addition, knowledge on predictors of employment are of importance to decrease the risk of reintegration failure after an acute coronary syndrome.[9]

In the present study, we determined employment status three years after percutaneous coronary intervention (PCI). Next, we compared differences between CR participants and CR non-participants in employment status three years after PCI. Finally, we assessed predictors for being employed three years after PCI.

Methods

Setting and participants

The present study uses a prospective observational study design among patients that underwent first time PCI and were participating in the Norwegian Coronary Stent Trial (NorStent).[10] NorStent was an all-comer study with broad inclusion criteria and few exclusion criteria which was performed at all centres in Norway that perform PCI, thus covering the total Norwegian population of more than 5 million inhabitants. NorStent was a randomized controlled trial comparing long-term health effects of drug-eluting and bare-metal stents.[10] Participants were included from September 2008 to February 2011 with five years follow-up. Eligible participants were men and women who presented with stable angina or an acute coronary syndrome, had a lesion in native coronary arteries or coronary-artery grafts amenable for PCI, had a Norwegian national identification number and were able to communicate in Norwegian, and provided informed consent. A total of 9,013 participants were included in NorStent. After three years of follow-up, 7,068 patients (82%) responded to a postal survey which included questions on employment status. Baseline characteristics have been reported previously.[11] To avoid patients that became unemployed due to retirement, we excluded patients from analysis who were 60 years and older at the index event. A total of 2,488 patients with complete employment status data three years after PCI were accepted for inclusion in the present study.

Data collection

Clinical- and demographic data were retrieved from the patients' electronic medical records at the index event by specially trained registered nurses. Patient outcomes, including CR participation, were measured three years after the PCI procedure using validated questionnaires as well as questions developed specifically for this study. A study coordinating

centre at the Institute of Clinical Medicine, the Arctic University of Norway, administrated the collection of follow-up data. Patients were sent reminders by phone and postal letter to complete and return their questionnaires.

Cardiac rehabilitation

Attendance in a CR programme during the period from the index event and to 36 months, was assessed by asking study participants the following questions: (1) Have you participated in a shorter ambulatory CR programme lasting for hours or days? (2) Have you participated in a hospital- or centre-based in-patient CR programme lasting for one or more weeks? The response options were ‘yes’, ‘no’, or ‘uncertain’.CR attendance was coded as “yes” if the patient answered ‘yes’ to one or both questions, and “no” if the patient answered ‘uncertain’ or ‘no’ to both questions.

Employment status

Employment status 36 months after the index event were ascertained by asking the study participants if they were currently employed full-time or part-time, unemployed, retired on disability pension, or on sick leave full-time or part-time, or if they were homemakers. Employment status was categorised as ‘employed’, ‘unemployed’ or ‘retired’. Being employed was classified as employed full-time or part-time. Being unemployed was classified as unemployed or sick-leave full-time or part-time. Being retired was participants that reported to receive full-time or disability pension. The combinations part-time employed / part-time sick-leave or retired / part-time sick leave, were categorized as unemployed (<33 patients).

Ethical issues

The study conformed to the principles outlined in the Declaration of Helsinki.[12] All participants gave written informed consent to participate in the study and were informed about the opportunity to withdraw the consent at any time without giving a reason or prejudice regarding further treatment. Study participants received routine medical treatment after PCI. The NorStent trial protocols were reviewed and approved by the National Committees for Research Ethics in Norway and by the Norwegian Social Science Data Services (NSD19480, PREKNORD40/2008), and is registered in ClinicalTrial.gov (NCT00811772).

Statistical analysis

Categorical data are presented as counts and percentages, and continuous data as means with standard deviations. To adjust for the effect of non-random distribution of covariates on CR, a propensity score method was used for comparisons of employment status after 3 years of follow-up among CR participants and non-participants.[13] In the present study, the propensity score was calculated for each patient in the total cohort of 2,488 patients using a logistic regression model to estimate the probability of participating in CR. The variables included in this model were age, gender, educational level, smoking status, body mass index (BMI), prior myocardial infarction (MI) or coronary artery bypass graft, diabetes mellitus, prior lipid-lowering treatment, prior hypertension treatment, regional health authority and indication for PCI. Once the propensity scores were estimated for each patient, matching was performed using a match tolerance level of 0.02. This leaves us with 708 patients in each group (CR yes vs. CR no). Covariate balance was checked as recommended for studies reporting propensity score analyses[14] Between-group comparisons in employment status were performed using conditional logistic regression.

Logistic regression analysis was used to identify predictors of being employed three years after PCI. Possible predictors were independent variables known to be associated with severity of CHD[1] and geographical region; gender, age, living arrangement, educational level attained, smoking status, BMI, prior MI or coronary artery bypass grafting, prior stroke, prior diabetes mellitus, prior lipid-lowering treatment, prior hypertension treatment, left ventricular ejection fraction, PCI indication, CR, and regional health authority. Unadjusted and multivariable adjusted odds ratios (OR) of employment status were estimated with 95% confidence intervals (CI). The multivariable model included all independent variables. Due to missing values on some of the independent variables, the unadjusted odds ratios were calculated both with all available observations included and restricted to completed case analyses (n=2038). Two-way interactions between the independent variables and gender and age were assessed in the full multivariable model. A p-value of <0.05 was considered statistically significant. Data were organized in IBM SPSS data files, and statistical analyses were performed using IBM SPSS Statistics for Windows, version 25 (IBM Corporation, Armonk, New York).

Results

Baseline characteristics

Of the 9,013 patients who were enrolled in the NorStent trial, 2,488 were of working age (<63 years) three years following PCI. Males compromise 83.2% of the group, and the mean age was 52 years. The majority of the participants lived with a partner, 36.5% had more than 12 years of education and approximately half of the participants were current smokers. Prior lipid-lowering treatment and prior hypertension treatment were reported by 51.1% and 34.0% of the participants, respectively. An acute coronary syndrome was the indication for PCI among 63.7% of the participants (Table 1).

Employment status and Cardiac rehabilitation

After three years follow-up, the majority of the participants were employed, while 11.2% were unemployed and 18.6% were retired (Table 1). A total of 38.3% of the patients reported to have participated in a CR programme at some point during the period from baseline to 36 months (Table 1).

Table 2 shows employment status according to participation in CR in a propensity-matched cohort representing 1416 patients. The covariate balance is shown in Supplementary Material Appendix Table 1. In the propensity-matched cohort, employment status of participants who were in a CR programme did not differ from those who were not in a CR programme (p=0.580).

Predictors of being employed three years after PCI

The multivariable-adjusted analyses showed that male participants, participants living with a partner, and participants with a higher level of education had a significantly higher chance of being employed three years after PCI (Table 3). In addition, participants living in western part

of Norway had a greater chance of being employed compared to participants in the northern part of Norway (Table 3). Higher age, former smoking, prior myocardial infarction or coronary artery bypass grafting, and prior hypertension treatment were associated with lower chance of being employed (Table 3).

Discussion

In the present study we assessed participant employment status three years after PCI and whether CR participation and other demographic and clinical factors predict employment status. We found that 70% of participants 62 years and younger reported to be employed three years after PCI. A total of 38% of the participants reported to have participated in a CR programme. There were no differences in long-term employment status between CR participants and CR non-participants. Male gender, living with a partner and higher levels of education are associated with higher chance of being employed, while older age, previous cardiovascular morbidity, prior hypertension treatment and smoking status are associated with lower chance of being employed three years after PCI.

Differences between prior studies and the present study population, severity of the coronary disease, state of employment at inclusion and follow-up time make it difficult to compare our findings on employment status with previous studies. The present study showed that 70% of patients 62 years and younger reported to be employed three years after PCI. This percentage is only slightly lower than that for the general population in Norway aged 25 to 66 years old, 79% of which were employed during 2018.[15] In previous international studies of employed patients, 86-93% of the patients were found to have returned to work one year after acute MI.[16-19] However, detachment is present, in a Danish nationwide register-based study almost a quarter of MI patients reported to quit working one year after they successfully returned to work.[17] This demonstrates the importance of long-term follow-up when measuring return-to-work rates after cardiovascular revascularization. A population based Danish study including 21,926 patients, showed that five years after the first-time hospitalization for acute coronary syndrome, 88% were still a part of the workforce where 65% were in work, 19% were unemployed and 16% were on sick-leave.[20]

When it comes to retirement at an early age, a nationwide cohort study from Sweden found that approximately one-third of patients were granted disability pension within five years after CABG or PCI.[21] In the present study, about 19% of patients 62 years and younger, reported to be retired three years after PCI. This percentage is nearly double compared to the general population.[15] A history of long-term sickness absence prior to revascularization is a strong predictor for long-term sickness absence following PCI, followed by disability pension.[21, 22] In addition, disability pension at the time of coronary revascularization is associated with higher five-year mortality.[23] Taken together, these findings indicate that employment status is an important component of secondary prevention after a first-time PCI. The aim of CR is to improve later working capacity in younger patients and to prevent premature death.

Information about the effects of CR on return to work is scarce, and of the relevant studies, findings are inconsistent. The present study reveal, as shown previously in the same population,[11] that patients in working age in a higher degree participate in a CR programme compared to older patients. This is consistent with previous findings.[24, 25] Notably, CR participation can contribute to a delayed return to work.[26] Our propensity-matched comparison of patient employment status three years after PCI showed that employment status of those participating in CR did not significantly differ from those who did not participate in CR. However, since the employment status of our participants before the index event was unknown, we could not confidently determine whether changes in employment status could be related to CR participation or not. Moreover, at the time of our study, no national or international standard on return to work in CR programmes existed.[27] Thus, we were unable to determine the level of vocational support during CR. Nevertheless, the present study is an important contribution as todays' knowledge on the long-term effect of CR on employment status is scarce, of old age and inconclusive.[8]

A recently published guideline on reintegration strategies to promote optimal return to work in acute coronary syndrome patients recommend early identification of patients at risk of poor vocational outcome.[9] Knowing the predictors of future employment status can help to facilitate vocational reintegration for patients in need. The present study found that being male, living with a partner, and higher levels of educational attainment were associated with a greater chance of being employed three years after PCI. This is consistent with previous findings showing a beneficial association between educational level[16-18, 20] and living with a partner[16, 20] with return to work. Regarding gender differences, what we observed was consistent with the majority of previous findings, suggesting that women have lower rates of returning to work and longer sickness absences than men.[17, 20, 22] Dreyer et al. and Cauter et al, however, did not find gender differences in their study after adjustment for other characteristics.[16, 26]

The present study suggest that the chance of being employed decreases with age and previous cardiovascular morbidity. One possible explanation is that in Norway, disability pension could be granted to people with long-term work incapacity. In an early age, retraining for patients with blue collar work is an opportunity, but a less relevant option for patients that are to be grated old-age pension in near future. In addition, having a manual job has previously been associated with delayed return to work[26]. Patients reported to live in the Northern part of Norway have a higher chance of being unemployed in the present study. Fewer opportunities for retraining or changing type of job in the rural areas of Norway can be one explanation for these findings. Previous cardiovascular morbidity and current smoking were associated with lower chance of being employed three years after PCI, corresponding to prior research findings.[19] Overall, healthcare providers should pay attention to factors that are associated with unemployment in patients undergoing PCI to prevent future poor vocational outcome.

Methodological issues

The present study had many strengths, such as a large representative sample with, inclusion of only patients who were of working age, a prospective study design, long-term follow-up, and high response rate. Despite these strengths, there were some limitations. Firstly, we had no data on the dose of vocational support given in CR, participants' employment status at the index event, the participants' job satisfaction, participants experience of subsequent cardiac events during follow-up, and whether the participants had worked in white- or blue-collar jobs. Those kinds of data could have had an impact on their employment status at the 36-month follow-up. Secondly, as this was a prospective observational study, it could be susceptible to bias. To reduce bias, however, and control for several possible confounding factors when analysing the effect of CR on employment status, we performed propensity score matching.

Conclusions

Despite improvements in the prognosis for CHD patients, the present study suggests that a significant number of working-age patients remain unemployed three years after their first coronary revascularization. These individuals' employment status was not aided by CR participation. Focusing more vocational support on PCI patients who are older, lacking higher education and patients who are living alone may improve return to work, probability of successful societal reintegration, and perhaps quality of life.

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Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Author contributions

SJSO, HS, KHB, and TAH contributed to the conception or design of the work. SJSO, HS, TW, KHB, and TAH contributed to the acquisition, analysis, or interpretation of data for the work reported here. SJSO drafted the manuscript. All authors critically revised the manuscript, gave final approval, and agreed to be accountable for all aspects of this work, ensuring integrity and accuracy.

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Table 1. Baseline characteristics of participants at index event and employment status at 3 years of follow-up

Characteristic	(n=2488)
Age (years ± SD)	52 ± 5.5
Male gender, n (%)	2071 (83.2)
Living with a spouse/partner, n (%)	1953 (84.4)
Educational level ≤12 years, n (%)	1511 (63.5)
Current smoker, n (%)	1137 (48.9)
Body mass index (kg/m^2)	
>25 kg/m^2	1782 (71.6)
Medical history, n (%)	
Prior myocardial infarction	125 (5.0)
Diabetes mellitus	242 (9.8)
Prior CABG surgery	51 (2.0)
Prior stroke	42 (1.7)
Prior lipid-lowering treatment	1256 (51.1)
Prior HT treatment	840 (34.0)
Left ventricular ejection fraction, n (%)	
>40%	897 (94.7)
Indication for PCI, n (%)	
Stable angina	586 (23.7)
Acute coronary syndrome	1889 (76.3)
3-year follow-up	
Employment status, n (%)	
Unemployed	278 (11.2)

Employed	1747 (70.2)
Retired	463 (18.6)
CR participation	
Yes	953 (38.3)

Values are means (SD) or n (%).

SD: standard deviation; CR: cardiac rehabilitation; CABG: coronary artery bypass graft; HT: hypertension; PCI: percutaneous coronary intervention.

Table 2. Differences in employment status between CR participants and CR non-participants three years after percutaneous coronary intervention[a]

	CR participants (n=708)	CR non-participants (n=708)	*p*-value[b]
Unemployed	85 (10.2)	77 (10.9)	0.580
Employed	499 (70.5)	494 (69.8)	—
Retired	124 (17.5)	137 (19.4)	—

Values are n (%).

[a]Table shows results for the propensity-matched cohort (n=1416).

[b] Between-group comparisons in employment status were performed using conditional logistic regression

CR: cardiac rehabilitation.

Table 3. Odds ratios for being employed three years after percutaneous coronary intervention[a]

Unemployed[b] (reference) vs. employed	Unadjusted			Adjusted		
	OR	95% CI	P-value	OR	95% CI	*p*-value
Male (female = reference)	1.94	1.53 - 2.50	<0.001	1.93	1.50 - 2.50	<0.001
Age (years)						
<50 (reference)	1		<0.001	1		<0.001
50-55	0.62	0.48 - 0.81		0.66	0.50 - 0.87	
56-59	0.39	0.30 - 0.51		0.43	0.33 - 0.57	
Living arrangement (no = reference)						
Spouse/partner	1.48	1.15 – 1.91	0.002	1.40	1.07 - 1.82	0.014
Education level attained (≤12 years = reference)						
>12 years	2.17	1.76 - 2.70	<0.001	1.93	1.54 - 2.42	<0.001
Health Authorities						
North (reference)	1		<0.001	1		0.003
Central	1.10	0.78 - 1.53		1.07	0.75 - 1.53	
South/East	1.22	0.93 - 1.59		1.27	0.96 - 1.68	
West	2.07	1.47 - 2.90		1.89	1.32 - 2.71	
Smoking status						
Never (reference)	1		0.001	1		0.010
Former	0.65	0.51 - 0.83		0.71	0.55 - 0.93	
Current	0.81	0.62 - 1.06		0.98	0.74 - 1.31	
Body mass index (≤25 kg/m2 = reference)						
>25 kg/m2	1.00	0.81 - 1.23	0.997	1.00	0.80 - 1.26	0.997
Medical history (no = reference)						

Prior MI / CABG	0.49	0.34 - 0.71	<0.001	0.55	0.37 - 0.81	0.002
Diabetes mellitus	0.73	0.53 - 0.96	0.047	0.85	0.61 - 1.20	0.359
Prior stroke	0.48	0.24 - 0.96	0.038	0.65	0.31 - 1.35	0.244
Prior hypertension treatment	0.63	0.52 - 0.76	<0.001	0.69	0.55 - 0.86	0.001
Prior lipid-lowering treatment	0.71	0.59 - 0.86	<0.001	0.95	0.76 - 1.18	0.624
PCI indication (Stable AP = reference)						
Acute Coronary Syndrome	1.10	0.89 - 1.37	0.391	1.02	0.79 - 1.30	0.903
CR participation (no = reference)	1.02	0.83 - 1.24	0.877	1.01	0.82 - 1.25	0.940

[a] Due to missing in some of the independent variables, this analysis was restricted to completed case analyses of patients aged 59 years and younger at index event (n=2038).

[b] "Unemployed" was defined as patients who were unemployed or retired.

AP: Angina pectoris; CABG: coronary artery bypass graft; CI, confidence interval; CR: cardiac rehabilitation; HT: hypertension; MI: myocardial infarction; OR: odds ratio; PCI: percutaneous coronary intervention.

Supplementary Appendix Table 1. Baseline characteristics of the propensity-matched cohort (n=1416)

	Matched cohort		Standardised differences
	CR participants (n=708)	CR non-participants (n=708)	
Age, Years ± SD	52.3±5.3	52.1 ±5.6	0.037
Male, n (%)	572 (80.8)	567 (80.1)	0.018
Living arrangement, n (%)			
Spouse/partner	592 (83.6)	587 (82.9)	0.019
Educational level attained, n (%)			
≤12 years	442 (62.4)	444 (62.7)	-0.006
>12 years	222 (37.6)	264 (37.3)	0.006
Smoking status, n (%)			
Never	171 (24.2)	172 (24.3)	-0.002
Former	181 (25.6)	172 (24.3)	0.030
Current	356 (50.3)	364 (51.4)	-0.022
BMI (kg/m^2), mean ±SD	26.7 ±6.9	27.2 ±5.7	-0.079
Medical history, n (%)			
Diabetes mellitus	69 (9.7)	75 (10.6)	-0.030
Prior MI / CABG surgery	35 (4.9)	33 (4.7)	0.009
Prior lipid lowering treatment	346 (48.9)	345 (48.7)	0.004
Prior HT treatment	228 (32.2)	237 (33.5)	-0.028
Indication for PCI, n (%)			
Stable angina	106 (15.0)	114 (16.1)	-0.030
Unstable angina	74 (10.5)	78 (11.0)	-0.116
NSTEMI	245 (34.6)	249 (35.2)	-0.013
STEMI	283 (40.0)	267 (37.7)	0.047
Health authority, n (%)			
North	96 (13.6)	127 (17.8)	-0.116
Central	105 (14.8)	101 (14.3)	0.014

South/East	395 (55.8)	328 (46.3)	0.191
West	112 (15.8)	152 (21.5)	-0.047

SD: standard deviation; BMI: body mass index; CR: cardiac rehabilitation; MI: myocardial infarction; CABG: coronary artery bypass graft; HT: hypertension; PCI: percutaneous coronary intervention; NSTEMI: non ST-elevation myocardial infarction; STEMI: ST-elevation myocardial infarction.