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Diagnostic group differences in return to work and subsequent detachment from employment following cardiovascular disease: a nationwide cohort study

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Aims
Return to work and employment maintenance following cardiovascular disease (CVD) are important rehabilitation goals for people of working age. To identify people in particular need of vocational rehabilitation, we examined differences in return to work and subsequent detachment from employment among people with atrial fibrillation (AF), heart failure (HF), heart valve disease, and ischaemic heart disease.

Methods and results
We conducted a nationwide cohort study and included all individuals of working age (35–65 years) who were employed when diagnosed with incident CVD in 2018. We estimated sex- and age-standardized probabilities of remaining employed at 3, 6, and 12 months after diagnosis, and of detachment from employment within 6 months after having returned to work. Of 46 912 individuals diagnosed in 2018, 8187 were of working age and employed at diagnosis. The mean age was 54.7 years (SD = 6.7), and 74.0% were men. Within 1 year, 89.8% had returned to work, but within the subsequent 6 months, 23.5% of these experienced detachment from employment. At 3, 6, and 12 months after diagnosis the highest standardized probability of being employed was found among people with AF, whereas the lowest probability was found among people with HF (78.9% [95% confidence interval (CI): 77.3–80.4] vs. 62.2% [95% CI: 59.0–65.4] at 12 months). Similarly, the highest probability of detachment was found for people with HF [30.3% (95% CI: 26.9–33.7)].

Conclusion
People with HF present the highest probability of not returning to work. There is a need for developing and documenting effects of vocational rehabilitation strategies within comprehensive cardiac rehabilitation programmes.

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Return to work following CVD

**Graphical Abstract**

**Diagnosis group differences in return to work and subsequent detachment from employment following cardiovascular disease**

**Methods and cohort**
- A national register-based cohort study
- Setting: Denmark
- 35 - 65 years
- In employment at time of CVD diagnosis
- Incident CVD in 2018
- n = 8,187

**Results**
- 89.8% returned to work within one year after CVD diagnosis
- 23.5% experienced detachment from employment within six months after initial return

**Sex- and age-standardized probabilities of being in employment 12 months after CVD diagnosis**
- Atrial fibrillation
- Heart failure
- Heart valve disease
- Ischaemic heart disease
- 78.9%
- 62.2%
- 75.5%
- 76.9%

**Research Highlights:** People with heart failure might be in particular need of support when returning to work. Vocational rehabilitation strategies should be developed and included as part of comprehensive cardiac rehabilitation programmes to improve return to work.

**Keywords**
- Cardiac rehabilitation • Cardiovascular disease • Return to work • Employment • Vocational counselling • Vocational rehabilitation

**Introduction**

Cardiovascular disease (CVD) is a leading cause of morbidity and mortality, contributing to over 45% of all deaths across Europe. Despite of decreasing mortality, the disease burden remains high, underscoring the need for targeted, timely, and comprehensive cardiac rehabilitation services. As the incidence of CVD is increasing among people of working age, return to work is an important rehabilitation goal of high relevance for individuals, as well as societies. Despite a growing scientific interest in this area, guidelines on vocational rehabilitation remain unclear in most European countries, and more knowledge is needed in order to develop targeted vocational rehabilitation strategies that meet the needs of people who are returning to work.

Return to work following CVD is a complex process influenced by multiple factors and determinants of unfavourable work reintegration outcomes include female sex, older age, lower level of education, and lower income. Adding to this, many people with CVD struggle with returning to work, e.g. feel pressured to return to work, have difficulties with returning to work at pre-CVD level, and sustaining employment after having returned.

Previous studies have mainly examined return to work within one diagnostic group, finding that return-to-work rates are moderate and with variation across diagnostic groups and countries. Furthermore, comparison of studies is limited by socio-political differences, including local legislations on sick leave and changes in legislation over time. To identify people in particular need of vocational rehabilitation, it is relevant to examine differences in return to work and subsequent detachment from employment in a mixed population comprising multiple diagnostic groups. In addition, return to work should be studied within a limited time span, allowing study participants to fall under the same sick leave legislation. Therefore, the aim of this study was to investigate return to work and subsequent detachment from employment in a Danish nationwide cohort of individuals diagnosed with the most common CVDs within 1 year and to estimate age- and sex-standardized probabilities of return to work and subsequent detachment from employment for each diagnostic group.

**Methods**

**Study design and study population**

We conducted a nationwide retrospective cohort study including all individuals with an incident hospital admission (in- or outpatient contact) in 2018 with a discharge diagnosis of atrial fibrillation (AF) (ICD-10: I48), heart failure (HF) (ICD-10: I11.0, I13.0, I13.2, I50, I42.0, I42.6, I42.7, I42.9), heart valve disease (HVD) (ICD-10: I05–I08, I34–I37) or ischaemic heart disease (IHD) (ICD-10: I20–I25). Individuals diagnosed with the same diagnosis within the previous 10 years were excluded. Individuals diagnosed with more than one CVD in 2018 were included based on the first diagnosis in time, with A diagnoses ranking higher than B diagnoses, and HF ranking higher than IHD ranking higher than HVD ranking higher than AF. Only individuals between 35 and 65 years, who were self-supportive (not receiving social welfare benefits, e.g. sick leave or unemployment benefits) for at least three consecutive weeks in a three-months period before date of diagnosis were included.

**Data sources**

In Denmark, all residents are assigned a permanent and unique civil personal registration number at birth or immigration, which allows for accurate linkage of data from nationwide administrative registries at an individual level. The Danish nationwide registries are validated and have been described in detail previously. We included data from the following registries, obtained from Statistics Denmark: (i) The Danish National Patient Registry containing information on all hospital admissions; (ii) The Danish National Prescription Registry containing information on redeemed prescriptions; (iii) The Danish Civil Registration System containing...
The Population's Education Register containing information on educational attainment.\textsuperscript{20} (v) The Income Statistics Register containing information personal income,\textsuperscript{21} and (vi) the DREAM (Danish Register-Based Evaluation of Marginalization) database containing weekly information on all persons with a Danish civil personal registration number who have received social benefits or any other transfer income since 1991.\textsuperscript{22}

**Outcomes**

Return to work was defined as being self-supporting (not receiving public social welfare benefits, e.g. sick leave benefit or unemployment benefit) for at least four consecutive weeks. Return to work was measured in two ways: (i) having worked for four consecutive weeks within 1 year after CVD diagnosis and (ii) being back at work for four consecutive weeks in the last week for a given period (3, 6, or 12 months after diagnosis). Both measures were identified using the DREAM database, where individuals are registered once a week with a code representing the type of transfer payment received that week.\textsuperscript{22} Hence, a record of four consecutive weeks with no transfer income was assumed to reflect employment.

For individuals who returned to work within 1 year after date of diagnosis, we examined the probability of detachment from employment after initial return during a six-months follow-up period. Detachment was defined as not being self-supporting but receiving public benefits of any duration (grouped into sick leave benefit, unemployment benefit or other benefit, and pension (including disability pension)). In addition, individuals who emigrated or died were defined as being detached from employment. Information on detachment is obtained from the DREAM Database.\textsuperscript{22}

**Covariates**

Information regarding sex, age at diagnosis, country of birth (Denmark; other Western; non-Western), and cohabitation was obtained from The Danish Civil Registration System.\textsuperscript{19} Information regarding highest attained educational level (basic; secondary; tertiary; postgraduate) was obtained from the Population Education Register,\textsuperscript{26} and information regarding average 5-year household income before time of diagnosis was obtained from the Income Statistics Register.\textsuperscript{21} Information on comorbidities (CVD comorbidity; diabetes; chronic obstructive pulmonary disease (COPD); chronic kidney disease (CKD); and depression) was obtained from The Danish National Patient Register\textsuperscript{18} and/or The Danish National Prescription Registry\textsuperscript{24} (see supplementary material online, Table S1 for additional information).

**Statistics**

Characteristics of participants were reported as frequencies and percentages separately for the different diagnostic groups. The age distributions were summarized by means and standard deviations. Characteristics of participants were also reported according to participants’ return to work status (having returned to work for at least four consecutive weeks within 1 year after time of diagnosis) and detachment status (detachment from employment within 6 months after having returned to work). Differences between groups were tested by applying the $\chi^2$ test. Regarding subsequent detachment from employment, the status of the participants at the time of detachment, e.g. the type of benefit received, was reported as frequencies and percentages.

**Return to work**

Logistic regression was used to associate the probability of being employed 3 months (6 months, 12 months) after diagnosis with additive effects of sex, age group, and diagnostic group. Here, return to work was defined as having been self-supporting for at least four consecutive weeks, and still being self-supporting. For each diagnostic group, we reported the standardized probabilities with 95% CI according to the sex and age group distribution of all patients.

**Detachment from employment**

Subsequent detachment from employment was defined as detachment of any duration in the subgroup of patients who returned to work for at least four consecutive weeks within 1 year after diagnosis. Logistic regression was applied in this subgroup with additive effects of sex, age group, and diagnostic group. For each diagnostic group we reported the standardized probabilities with 95% CI according to the sex and age group distribution of all patients in the subgroup.

The level of statistical significance was set at 5%. Data management and statistical analyses were performed using R software.\textsuperscript{25}

**Ethics**

In Denmark, ethical approval is not required for register-based studies that are conducted for the sole purpose of statistics and scientific research. However, the study is approved by the data responsible institute (Capital Region of Denmark—Approval number: P-2019-537) in accordance with the General Data Protection Regulation (GDPR).

**Results**

We identified 46,912 individuals diagnosed with incident CVD in 2018, of which 12,231 (26.1%) were of working age (35–65 years). Of these, a total of 8187 (66.9%) individuals were employed at time of diagnosis, constituting the study population (Figure 1). A total of 6058 (74.0%) were men, and the median age was 54.7 years. Most study participants were diagnosed with ischaemic heart disease (48.1%), followed by AF (31.4%), HF (10.6%), and heart valve disease (9.9%). Demographics and clinical characteristics are shown in Table 1.

**Return to work within 1 year after diagnosis and subsequent detachment from employment**

A total of 7356 individuals (89.8%) returned to work within 1 year after date of diagnosis (Table 2). When following these individuals for 6

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**Figure 1** Flow chart showing the selection of the study population.
months after their initial return, 1730 individuals (23.5%) experienced subsequent detachment from employment. In univariate analyses, variables associated with return to work included younger age (P-value < 0.001), higher educational level (P-value < 0.001), higher income (P-value < 0.001), and not having comorbidities (P-value < 0.001) (Table 2). Variables associated with subsequent detachment from employment included lower educational level (P-value < 0.001), lower income (P-value < 0.001), and comorbidity (P-value < 0.05) (Table 2).

### Sex- and age-standardized probabilities of return to work

Table 3 shows the sex- and age-standardized probabilities of return to work at 3, 6, and 12 months after CVD diagnosis for each diagnostic group. At 3 months, the highest probability of being employed was 76.9% (95% CI: 75.3–78.6) among individuals diagnosed with AF, whereas the lowest probability of being employed was found among individuals diagnosed with HF (51.2%, 95% CI: 47.9–54.5). Similar results were observed after 6 months, and after 12 months where the probability of being employed was 78.9% (95% CI: 77.3–80.4) for individuals with AF, and 62.2% (95% CI: 59.0–65.4) for individuals with HF. Figure 2, which depicts the status of study participants at 3, 6, and 12 months after CVD diagnosis, shows that the proportion of individuals in employment increased during the first year after diagnosis, with exception of AF, where equal proportions were observed at 6 and 12 months.

### Sex- and age-standardized probabilities of detachment from employment

Table 3 shows the sex- and age-standardized probabilities of detachment from employment among the individuals who returned to work within 1 year after their CVD diagnosis (n = 7356). The characteristics of individuals included in the analysis of detachment are included in supplementary material online, Table S2. The lowest probability of detachment was found among individuals diagnosed with AF (19.9%, 95% CI: 18.3–21.5), whereas the highest probability of detachment was found among individuals diagnosed with HF (30.3%, 95% CI: 28.8–31.8).
### Table 2  Return to work within 1 year after date of diagnosis, and subsequent detachment from employment within 6 months after return to work

<table>
<thead>
<tr>
<th></th>
<th>RTW within 1 year after CVD diagnosis (n = 8187)</th>
<th>Detachment from employment within 6 months after RTW (n = 7356)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Sex</td>
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<td></td>
</tr>
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<td>1890</td>
</tr>
<tr>
<td>Male</td>
<td>592</td>
<td>5466</td>
</tr>
<tr>
<td>Age</td>
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<td></td>
</tr>
<tr>
<td>Mean (SD)</td>
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</tr>
<tr>
<td>35–40 years</td>
<td>25</td>
<td>7.6</td>
</tr>
<tr>
<td>41–45 years</td>
<td>47</td>
<td>8.1</td>
</tr>
<tr>
<td>46–50 years</td>
<td>114</td>
<td>10.2</td>
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<tr>
<td>51–55 years</td>
<td>180</td>
<td>9.4</td>
</tr>
<tr>
<td>56–60 years</td>
<td>227</td>
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<tr>
<td>61–65 years</td>
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<tr>
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<td>AF</td>
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<tr>
<td>HF</td>
<td>183</td>
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<td>HVD</td>
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<tr>
<td>IHD</td>
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<td>9.5</td>
</tr>
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<tr>
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<tr>
<td>Non-Western</td>
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<tr>
<td>Other Western</td>
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<td>9.1</td>
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<tr>
<td>Education</td>
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<td></td>
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<tr>
<td>Basic</td>
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<td>Secondary</td>
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<tr>
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<tr>
<td>Postgraduate</td>
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<td>Income quartiles</td>
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<tr>
<td>Lowest</td>
<td>301</td>
<td>15.3</td>
</tr>
<tr>
<td>193 (9.8)</td>
<td>1775</td>
<td>90.2</td>
</tr>
<tr>
<td>Highest</td>
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</tr>
<tr>
<td>Cohabitation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alone</td>
<td>266</td>
<td>13.1</td>
</tr>
<tr>
<td>With others</td>
<td>542</td>
<td>9.0</td>
</tr>
<tr>
<td>CVD comorbidity</td>
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<tr>
<td>No</td>
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<td>9.1</td>
</tr>
<tr>
<td>Yes</td>
<td>216</td>
<td>15.4</td>
</tr>
<tr>
<td>Diabetes</td>
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<tr>
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<td>9.7</td>
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<td>23.5</td>
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<tr>
<td>CKD</td>
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<td>9.7</td>
</tr>
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<td>58</td>
<td>28.9</td>
</tr>
<tr>
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<td></td>
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<tr>
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<td>700</td>
<td>9.3</td>
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<tr>
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<tr>
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<td>700</td>
<td>9.3</td>
</tr>
<tr>
<td>Yes</td>
<td>553</td>
<td>28.9</td>
</tr>
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Continued
26.9–33.7). This is mirrored in Figure 2, which shows higher proportions of individuals with HF receiving sick leave benefit at 3, 6, and 12 months after CVD diagnosis compared with the other diagnostic groups. At the time of detachment, 71.9% received sick leave benefits, 20.5% received unemployment benefits or other benefits (of which 13.0% were in a job clarification programme, which is for individuals who are unable to work due to illness, but who are not entitled to have their sickness benefit extended, and 4.2% in a flexi-job, a form of employment for individuals with significantly and permanently limited working capacity), 5.9% had left the workforce for retirement, and few had died (0.8%) or emigrated (0.9%) (Table 4).

Table 2 Continued

<table>
<thead>
<tr>
<th>RTW within 1 year after CVD diagnosis (n = 8187)</th>
<th>Detachment from employment within 6 months after RTW (n = 7356)</th>
</tr>
</thead>
</table>
| No
n = 831 (10.2%) | Yes
n = 7356 (89.8%) | P-value |

<table>
<thead>
<tr>
<th>Yes</th>
<th>P-value</th>
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</thead>
<tbody>
<tr>
<td>131 (20.8)</td>
<td>499 (79.2)</td>
</tr>
<tr>
<td>337 (67.5)</td>
<td>162 (32.5)</td>
</tr>
</tbody>
</table>

RTW, return to work; CVD, cardiovascular disease; AF, atrial fibrillation; IHD, ischaemic heart disease; HVD, heart valve disease; HF, heart failure; COPD, Chronic obstructive pulmonary disease; CKD, chronic kidney disease. Data are presented either as means ± standard deviation (SD) or numbers (%).

Discussion

In this Danish nationwide register-based cohort study, we found that 89.8% of the individuals employed at time of CVD diagnosis had returned to work within 1 year. However, when following these individuals for 6 months after their initial return, 23.5% had experienced detachment from employment. Individuals with HF exhibited a lower probability of returning to work, and a higher probability of detachment from employment after their initial return, compared with individuals diagnosed with other CVDs.

Previous Danish studies of return to work after CVD have reported return-to-work patterns similar to us, with high proportions of individuals experiencing detachment from employment after their initial re-employment.9,11,16 Smedegaard et al.11 performed a study in a Danish cohort of patients discharged after acute myocardial infarction and found that although most patients returned to work within 1 year (91.1%), 24.2% was detached from employment 1 year after their return. Similarly, Hagengard et al.16 followed a Danish cohort of people aged 18–65 years diagnosed with AF during a median follow-up time of 6.2 years and found that despite 96.5% had returned to work after 30 days, 68.5% subsequently left the workforce, with a median time to withdrawal from work on 1.5 year. Thus, although we did not examine long-term occupational outcomes, our study illustrates that detachment is common already within few months after vocational reintegration. Not surprisingly, the highest detachment rate (27.6%) was observed among the oldest age group (61–65 years), probably reflecting that these participants were most likely to withdraw from the workforce for retirement. However, the high detachment rate (24.6%) found among the youngest participants (35–40 years) should be noticed as it is crucial to ensure a stable attachment to the workforce for these individuals, who potentially have many working years left. In general, the high proportion of individuals experiencing subsequent detachment from employment emphasizes the need for developing vocational rehabilitation strategies that focus both on vocational reintegration and on employment maintenance. This is important as unemployment is related to worsened self-assessed health,16 and long-term sick leave increases the risks of both disability pension and unemployment.27 Thus, as suggested by others, individuals in risk of poor occupational outcomes should be identified early in the rehabilitation process.28

In our study, the probability of being employed at 3, 6, and 12 months after time of diagnosis indicated variation between diagnostic groups, with lowest probabilities found among people with HF. To our knowledge, few studies have previously explored differences in return to work between diagnostic groups, but in an Australian survey-based study by Thakkar et al.29 people with acute coronary syndrome returned to work more often than people with HF. In addition, although common across diagnostic groups, the highest probability of detachment was found for people with HF. Similarly, in the Danish study by Smedegaard et al.11, including patients discharged after acute myocardial infarction, detachment from employment was associated with
having concomitant HF. These observed differences between diagnostic groups likely reflect variation in disease burden and in adverse effects on physical and mental health caused by the specific diagnosis. In example, the high detachment rate found for HF exemplifies that this is a progressive disorder whereby cardiac structure and function continue to deteriorate. Adding to this, our results reflect that HF significantly reduces the ability to maintain a normal life and live independently, which has been confirmed in qualitative studies. Hence, people with HF might be in particular need of support when returning to work, and as suggested in a Swedish study by Lindbäck and Nordgren, including people on sick leave due to HF, collaboration and coordination between rehabilitation professionals is needed to support this patient group.

The return-to-work experiences of this patient group should though be studied further, as the existing qualitative literature is scarce, probability because of the low prevalence of HF in working age adults (20 to 64 years), approximately 8.9% for men and 5.4% for women.

Adding to the observed differences related to participants’ health status, we also found that comorbidity was associated with return to work and detachment from employment, which is in line with previous studies. In relation to this, physical limitations, e.g. fatigue, is a commonly reported barrier for return to work in the existing literature, and together, this supports the need for individualised re-integration strategies focusing on each individual’s disease and condition, as suggested in a recent systematic review and meta-analysis.

Our results also indicated socio-economic differences in return to work. In accordance with previous studies, we found that lower educational level and lower income unfavoured return to work and employment maintenance. This implies that vocational rehabilitation strategies need to pay special attention to individuals of lower socio-economic status. As workers with low socio-economic position are more prone to unfavourable physical and psychosocial working conditions, and more often face psychosocial problems outside the workplace compared with workers with a high socio-economic position, they might experience additional barriers for returning to work. As such, not only physical barriers but also work-related barriers (such as having a manual job, or having no possibility of workplace adaptations) and psychosocial barriers (such as anxiety and depression) should be considered when assessing an individual’s ability to return to work. This corresponds well with a recent Cochrane review that identified evidence for effects of cardiac rehabilitation programmes, including both exercise and psychosocial counselling components. The review found that such programmes probably shorten the time needed to return to work (moderate-certainty evidence) and may increase the number of patients who return to work in the first 6 months after a myocardial infarction, coronary artery bypass grafting, or percutaneous coronary intervention (low-certainty evidence). However, the authors conclude that more evidence is needed to

Table 4 Type of benefit received at time of detachment or other reason for detachment

<table>
<thead>
<tr>
<th>Total</th>
<th>Unemployment or other benefit</th>
<th>Sick leave benefit</th>
<th>Pension</th>
<th>Death</th>
<th>Emigration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>355 (20.5)</td>
<td>1244 (71.9)</td>
<td>102 (5.9)</td>
<td>14 (0.8)</td>
<td>15 (0.9)</td>
</tr>
</tbody>
</table>

Data are presented as numbers (%).
determine if combined interventions are truly effective in promoting return to work for people with coronary heart disease. They also point at a research gap regarding work-directed interventions that may hold potential of eliminating barriers to returning to work, e.g. by providing return-to-work coordination and individual work-directed recommendations.37 Also more recently, researchers have documented that cardiac rehabilitation holds potential in improving return to work,17,38 but more research is required into effective strategies to support work reintegration, particularly for people with HF. A review addressing return to work for people with HF, also previously stressed this need for further research, and emphasized a need to screen this patient group for risk factors associated with not returning to work, and to counsel those patients who are able to resume work.34

When considering the socio-economic disparities, it should be mentioned that the Danish welfare system is characterized by a generally high level of social security, including provision sickness benefits and disability benefits. Hence, worse return-to-work outcomes are expected in countries with less generous social benefit systems and with more socio-economic inequalities. Although international comparison of our results is limited due to differences in occupational systems and legislations, we do believe that the observed differences between diagnostic groups are generally universal across countries and can be generalised to similar patient populations and inform rehabilitation strategies across European countries to improve the success rate of not only returning to work but also maintaining employment following CVD.

Strengths and limitations
The main strengths of the study relate to the study design. The nationwide cohort study using complete and comprehensive data from administrative registries minimized selection bias, recall bias, and misclassification. The large population included all employed individuals diagnosed with CVD within one single calendar year, and this study period allowed us to examine return to work among individuals who were returning to work under the same sick leave legislation. In addition, the study period provides an up-to-date picture of the return-to-work rate for individuals with CVD, and by studying a mixed patient population with the four most common CVD’s, we were able to examine differences in return to work and subsequent detachment from employment between diagnostic groups.

Our study also has some limitations. First, occupational status could be subject to misclassification. We defined return to work as being self-supporting for a minimum of four consecutive weeks and not receiving public benefits. Although, this definition has been used in several previous studies,38-40 and a DREAM record of self-support has been validated with a positive predictive value of 98.2%,22 it is likely that not all individuals who appeared to be self-supporting in the DREAM database had actually returned to work. E.g. it is possible that individuals were being supported by their spouse. However, in Denmark this is rather uncommon as <1% of the population between 35 and 65 years are without personal income.41 Second, we did not explore actual and underlying reasons for not returning to work and for detachment from employment, and as the DREAM database does not include cause of sick leave, we consequently do not know whether a participant was off work due to sickness caused by their CVD diagnosis. Furthermore, we are not able to assess whether individuals have been on full- or part-time sick leave, or the exact period of the sick leave. However, most sick leave observed in this study is expected to be of long-term, as sickness absence is not registered in the DREAM database until the employee’s salary after 30 days is reimbursed by the municipalities. Adding to this, the long-term occupational status of the included individuals remains unknown. However, given the aim of our study the data available on sick leave and the applied follow-up periods were sufficient to explore diagnostic group differences in return to work and subsequent detachment from employment and to identify individuals who might be in particular need of vocational rehabilitation. Furthermore, it is important to consider that our definition of detachment from employment encompass individuals in flexi-jobs, a form of employment that takes impaired ability to work into account, and that this can reflect a positive and desired return-to-work outcome.

Lastly, we were not able to examine the impact of work-related factors on return to work, such as occupational requirements (e.g. job function and tasks), as this information was not available for the present study. Neither were we able to include register-based information on cardiac rehabilitation participation as this is not systematically registered for all CVD patients. Thus, although the national registries allowed us to examine diagnostic group differences in return to work, the effect of multiple factors impacting on work resumption remains unknown. Future qualitative studies are needed to examine the complexity of the return-to-work process from the perspectives of individuals diagnosed with CVD, including an exploration of the underlying reasons for not returning and not maintaining employment. In this regard, to inform future qualitative explorations of specific subgroups’ experiences, investigating return to work among specific subcategories of CVD (e.g. type of ischaemic heart disease or AF) may be relevant.

Conclusion
The results of the present study show diagnostic group differences in return to work following CVD and indicate a need to strengthen the focus on vocational rehabilitation strategies within comprehensive cardiac rehabilitation programmes. People of working age in risk of poor vocational reintegration should be identified early in every rehabilitation programme and stratified approaches are warranted as our results indicate that people with HF might be in particular need of support when returning to work. It is important to attend to medical, work-related, and psychosocial factors that affect the ability to return to work. As such, the present study highlights the need for developing and documenting evidence-based vocational rehabilitation strategies with the ultimate aim of increasing the proportion of people with CVD who return to work and maintain employment and thereby increase individuals’ quality of life and reduce societal costs.

Authors’ contributions
All authors contributed to the conception or design of the work. All authors contributed to the acquisition, analysis, or interpretation of data for the work. SMBJ conducted the data analysis. TAG revised the data analysis. SMBJ drafted the manuscript. NFJ, GG, ME, SB, TM, and MK critically revised the manuscript. All authors gave final approval and agree to be accountable for all aspects of work.

Supplementary material
Supplementary material is available at European Journal of Preventive Cardiology online.

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Conflict of interest: None declared.

Data availability
The data that support the findings of this study are available from Denmark’s Statistics. Restrictions apply to the availability of these data and data are not publicly available. Only Danish research environments are granted authorisation from Statistics Denmark. However, foreign researchers, can get access through an affiliation to a Danish authorised research environment.

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