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Return to work and everyday life following out-of-hospital cardiac arrest. Results from the national survey, DenHeart

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ABSTRACT

Background: With increasing survival rates following out-of-hospital cardiac arrest (OHCA), knowledge on return to everyday life, including return to work, should be getting increasing attention.
Objectives: To i) describe patterns of labor market affiliation up to 12 months after discharge among a workforce population and to, ii) investigate the association between clinical and sociodemographic characteristics, self-reported health at discharge and a composite endpoint of prolonged sick leave and leaving the workforce after 3 and 12 months.
Methods: Data from the national survey, DenHeart, were used, including measures of self-reported health: HeartQoL and the Hospital Anxiety and Depression Scale (HADS), combined with register-based follow-up.
Results: During the study period, n = 572 OHCA patients were discharged from five Heart centres, n = 184 were part of the workforce. At discharge, 60% were on paid sick leave, and 20% at 12 months. Age (per one year older) increased the odds of experiencing the composite endpoint at 3 and 12 months (3 months: OR 1.06 95%CI 1.03–1.10, 12 months: OR 1.06 95%CI 1.03–1.09) among the total population (n = 184). Self-reported health at discharge was not associated with the endpoint.
Conclusion: One-fifth of the OHCA survivors at a working-age prior to the OHCA was still on paid sick leave after 12 months. Increasing age was the only characteristic associated with a composite endpoint of prolonged sick leave or leaving the workforce at 3 and 12 months after discharge.
With increasing survival rates, healthcare professionals need to support the population in resuming daily life, including returning to the workforce, when relevant.

Introduction

As survival rates following out-of-hospital cardiac arrest (OHCA) have improved to an average of 8% across Europe and 16% in Denmark (30-days), the clinical pathway and post-arrest outcomes have gained increasing attention.[1,2] Improved outcomes often include resuming daily life, which, among survivors working at the time of the OHCA, might include returning to work.[3]

Abbreviations: BMI, Body Mass Index; CABG, Coronary Artery Bypass Grafting; CI, Confidence Intervals; HADS, Hospital Anxiety and Depression Scale; HRQoL, Health-related Quality of Life; ICD-10, International Statistical Classification of Diseases and Related Health Problems; IQR, Interquartile Range; NPR, The Danish National Patient Register; OHCA, Out-of-hospital Cardiac Arrest; OR, Odds Ratio; PCI, Percutaneous Cardiac Intervention; SD, Standard Deviation

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In general, sick leave is a genuine problem with potential negative personal and economic consequences.[4] Causes of not returning to work can be related to the sequelae of cardiac arrest, as the survivors might suffer from e.g. cognitive impairment and fatigue.[5,6] Similarly, these consequences may hamper the ability to fulfill previous job demands and tasks.[7] In addition, studies have demonstrated how the survivors report impaired health-related quality of life (HRQoL)[8,9] and high levels of psychological distress, including symptoms of anxiety and depression.[6,10] In general, mental health issues seem to be worse among OHCA survivors compared to a general population, particularly among the younger patients (below the age of 65 years).[9,10] Thus, the OHCA might adversely affect overall functioning in daily life and, thereby, the ability to return to work among a working population.[3,6,8]

A previous study has described how 27% of the patients working at the time of the OHCA were still on sick leave 180-days post-arrest.[3] Of those, 47% reported restricted functioning in daily life.[3] Similarly, others have described how only approximately 3 out of 4 OHCA survivors had returned to work after one year.[6] This highlights how returning to work following OHCA might be challenging for the survivor.

To support the OHCA survivor in returning to the workforce, gaining insight into factors associated with returning – or not returning – to the workforce is essential. These factors might lead to an awareness of focus areas and thus, help clinicians improve the patient pathway following OHCA.[11] It has previously been demonstrated how older age (compared to being younger), cognitive impairment, fatigue, low educational level and being part-time employed prior to the cardiac arrest were associated with *not* returning to work.[3,11,12] Contrary, better HRQoL has been shown to increase the odds of returning to the workforce.[11] In general, though, the topic is sparsely investigated, indicating the need for more knowledge to support the OHCA survivor resuming everyday life and returning to work.

Thus, in a workforce population of OHCA survivors, the objectives were to i) describe patterns of labor market affiliation up to 12 months after discharge and to ii) investigate the association between clinical and sociodemographic characteristics, self-reported health at discharge and a composite endpoint of prolonged sick leave and leaving the workforce at 3 and 12 months (short- and long-term after discharge).

Methods

Study design

The current study is based on data from the national DenHeart study, a study based on patient-reported outcomes measured at hospital discharge combined with 1-year register-based follow-up. The design of the overall DenHeart study is described in detail in a previously published study protocol[13] and elaborated in the current study.

Setting and participants

All patients were consecutively included at hospital discharge from all five Danish Hearts centres between April 2013 and April 2014. The patients were requested to participate in the survey before leaving the hospital. Patients transferred to another hospital were encouraged to complete the survey at the final hospital discharge. Patients either completed and returned the paper-based survey at discharge or by postal mail within three days after discharge.

In the current sub-study, patients diagnosed with cardiac arrest were included. The classification of diagnoses was based on international codes from the ICD-10 list (International Statistical Classification of Diseases and Related Health Problems)[14] and included: I460, I469, I490 and I490B.

Excluded were: Patients below the age of 18 years and above 63 years, patients without a Danish civil registration number and patients who did not understand Danish. The age limit of 63 was set to ensure a realistic possibility of returning to the workforce following the cardiac arrest (with retirement age, state pension age, of 65 years at the study time). In addition, patients who were unconscious when transferred to another hospital or too ill to participate were also excluded.

Data sources

Clinical and sociodemographic data

Clinical and sociodemographic data were obtained from the following national registers: The Danish National Patient Register (NPR),[15] The Danish Civil Registration System[16] and The Danish Education Register.[17] The following variables were included: sex, age, marital status (married or not), educational level (basic/primary school, upper secondary/vocational school, higher education), primary diagnosis (based on ICD-10 codes) and co-morbidity (hypertension, ventricular arrhythmia, ischemic heart disease, myocardial infarction, heart failure, renal disease, diabetes, chronic obstructive pulmonary disease, percutaneous cardiac intervention, PCI and coronary artery bypass grafting, CABG). Data on co-morbidity were obtained ten years back from the register, NPR (not including co-morbidity during the index admission). By going back ten years in the registries, we ensured a high coverage of co-morbidities. The number of co-morbidities was used to calculate the overall co-morbidity burden, based on the included co-morbidities in the Ontario Acute Myocardial Infarction Mortality Prediction Rules by Tu et al.[18] The co-morbidities were calculated into the "Tu-comorbidity index score"[18] and contained the following co-morbidities: arrhythmia, hypertension, congestive heart failure, cardiogenic shock, cerebrovascular disease, pulmonary edema, chronic obstructive pulmonary disease, malignancy, diabetes, acute and chronic renal failure and diabetes.

Sick leave and work attachment

All citizens in Denmark, who are part of the working force (employed or unemployed), are entitled to public financial benefits in case of sick leave.[19] Data on sick leave and absence from the labor market were obtained from the Danish DREAM registry, administrated by the Danish Agency for Labour Market and Recruitment.[20] The DREAM registry data provide information on the public financial benefits of all citizens who have received public transfer payments. The registry contains more than 100 codes available on public benefits reported in weekly inventories.[20] Only sick leave lasting longer than two weeks are included in the DREAM registry. Thus, data on short-term sick leave (below two weeks) are not registered.[20,21] Return to *work* indicates that the patient is, in reality, working again. In contrast, return to the *workforce* is used when the patient is available for the workforce (and not on sick leave).

The current study population was matched to the DREAM registry based on a unique Danish civil registration number, ensuring data on each patient could be matched to possible sick leave benefits. Based on the coding from DREAM, variables were grouped based on the patient's workforce attachment and divided into *Sick leave, Working/part of the workforce* or *Left of the workforce.*

The patients included in the group of working/part of the workforce were either employed or unemployed (but still able to work based on the coding in DREAM) or received paid leave or educational grants. Patients who had left the labor market due to early retirement or other reasons or did not have a permanent address in Denmark (immigration) were not considered part of the workforce.

Self-reported health at discharge

Self-reported health, including HRQoL, symptoms of anxiety and depression, were measured with the following patient-reported

outcomes measurements at discharge: HeartQol[22-24] and the Hospital Anxiety and Depression Scale (HADS).[25] Also, four ancillary questions regarding height and weight (to calculate body mass index, BMI), smoking status ("current daily smoker") and alcohol consumption were included. Alcohol consumption was grouped as intake above the national high-risk limit at the time of inclusion (above 14 units/week for women and 21 units/week for men).

HeartQoL is a 14-item, disease-specific questionnaire measuring HRQoL in cardiac patients.[22] The HeartQoL has a four-weeks recall, and the answers can be summarized into an overall Global, a Physical and an Emotional Score. The scores range from 0 to 3, with higher scores indicating a better HRQoL status. A Cronbach alpha of 0.92 (Global Score), 0.87 (Physical Score) and 0.91 (Emotional Score) have previously been demonstrated in patients with stable coronary artery disease.[26] The continuous scores of HeartQoL are used in the analyses.

HADS is a disease-specific/domain-specific questionnaire measuring symptoms of anxiety and depression. This instrument consists of 14-items, divided into two subscales; an anxiety scale (HADS-A) and a depression scale (HADS-D). The scales range from 0 to 21, with a cut-off score ≥8 indicating the presence of anxiety (HADS-$A \geq 8$) or depression (HADS-$D \geq 8$). The internal consistency of HADS has previously been reported with a Cronbach's alpha of 0.87 (HADS-A) and 0.82 (HADS-D) in a Danish population of cardiac patients.[27] Both continuous scores and the cut-off are used in the analyses.

Outcomes

In the current study, the main endpoints (the events) were a composite of prolonged sick leave or leaving the workforce at 3 and 12 months after discharge, respectively. The composite endpoint was chosen to investigate how clinical and sociodemographic characteristics, HRQoL and symptoms of anxiety and depression at discharge might affect the combined elements – from a short- and long-term perspective following discharge. Prolonged sick leave was defined as a sick leave period of more than the average (6 weeks, standard deviation, SD 5.58 at 3 months and 18 weeks (SD 20.01) at 12 months). To avoid a potential competing risk to the composite endpoint and thus, returning to the workforce, the analyses were only performed on patients alive at 1-year follow-up.

Sample size

The sample size was determined based on the main DenHeart study population.[13,28] With the current study being a descriptive, hypothesis-generating study, we did not calculate a required sample size a-priori. Still, a sample size of $n = 100$ was considered to be adequate in addressing the association between clinical- and sociodemographic characteristics and the composite endpoint based on the included number of characteristics investigated separately.

Statistical methods

Baseline characteristics were presented as numbers and percentages for categorical variables. Continuous variables were tested for normality using the Shapiro-Wilks test. As the normality assumption was not met, continuous variables were presented as the median with the interquartile range (IQR, from the 25th to the 75th percentile). Differences in patient characteristics among responders and non-responders were compared using the Pearson χ^2 –test for categorical variables and the Mann-Whitney *U* test for continuous variables.

The proportion of responders (part of the workforce) with symptoms of anxiety and depression (cut-off≥8) after discharge were presented as numbers and percentages.

A distribution plot was used to describe the pattern of sick leave and return to work 12 months after discharge, illustrating the differences in the proportion of patients on sick leave, part of the workforce and left the workforce up to 1 year following discharge.

Logistic regression analyses were performed to investigate the association between clinical- and sociodemographic characteristics, self-reported health at discharge (HRQoL, continuous scores of HeartQoL and symptoms of anxiety and depression, HADS-A and HADS-$D \geq 8$) and the association with the composite endpoint (the endpoint of prolonged sick leave or leaving the workforce) at 3 and 12 months after discharge. The models were adjusted for the following potential confounders: sex, age and Tu-comorbidity score. Model fit was tested with the Likelihood Ratio. Results are presented as odds ratios (OR) with 95% confidence intervals (CI).

The *p*-value was assigned with a 5% significance level. All analyses were performed using STATA version 16.1 (StataCorp LLC, Texas, USA).

Ethics

The DenHeart study complied with the principles outlined in the Declaration of Helsinki[29] and was approved by the Danish Data Protection Agency (2007–58–0015/30–0937). The DenHeart study is registered at ClinicalTrials.gov (NCT01926145) and approved by the institutional boards of the participating Heart Centers. According to Danish Legislation, the survey does not require approval from the human ethics committee system. Written consent was given along with the questionnaire.

Results

Population

During the DenHeart study period, 572 OHCA patients were discharged from the five Heart centres. Of those, 81 were excluded due to illness or language barrier, resulting in a total population of 491 patients and $n = 242$ between 18 and 63 years and, thus, of a working age (Fig. 1). Among the working population, 58 were excluded due to early retirement, resulting in 184 patients being part of the workforce. Of those, the total workforce population, the majority, 76% ($n = 139$), were men, the median age was 51 years (IQR 43–57), and 60% ($n = 110$) were married (Table 1).

The sub-analyses of responders of the workforce population ($n = 81$ patients, response rate 44%), revealed how responders were younger and had a higher educational level, compared with non-responders (Table 1).

Self-reported health

Table 2 depicts self-reported health (HRQoL, anxiety and depression) at hospital discharge among responders of the workforce population. Median scores of HeartQoL were: Global 2.07 (IQR 1.28–2.78), Physical 2.00 (IQR 1.20–2.80) and Emotional 2.50 (IQR 1.66–3.00). In addition, symptoms of anxiety at discharge were present among 33% ($n = 25$) (HADS-$A \geq 8$) and symptoms of depression among 17% ($n = 12$) (HADS-$D \geq 8$) (Table 2).

The pattern of sick leave and return to work following OHCA

The pattern of sick leave and return to work after discharge among the total population of patients being part of the workforce are illustrated in Fig. 2. Patterns of sick leave and return to work varied at different time points after discharge. At discharge, 60% ($n = 110$ were on paid sick leave, and 40% ($n = 74$) were registered as being working. At three months following discharge, 5% ($n = 9$) had left the workforce (due to early retirement, emigration or death), 43% ($n = 80$) were still on paid sick leave, and 52% ($n = 95$) had returned to work. At 12 months, 11% ($n = 20$) had left the workforce, 20% ($n = 37$)

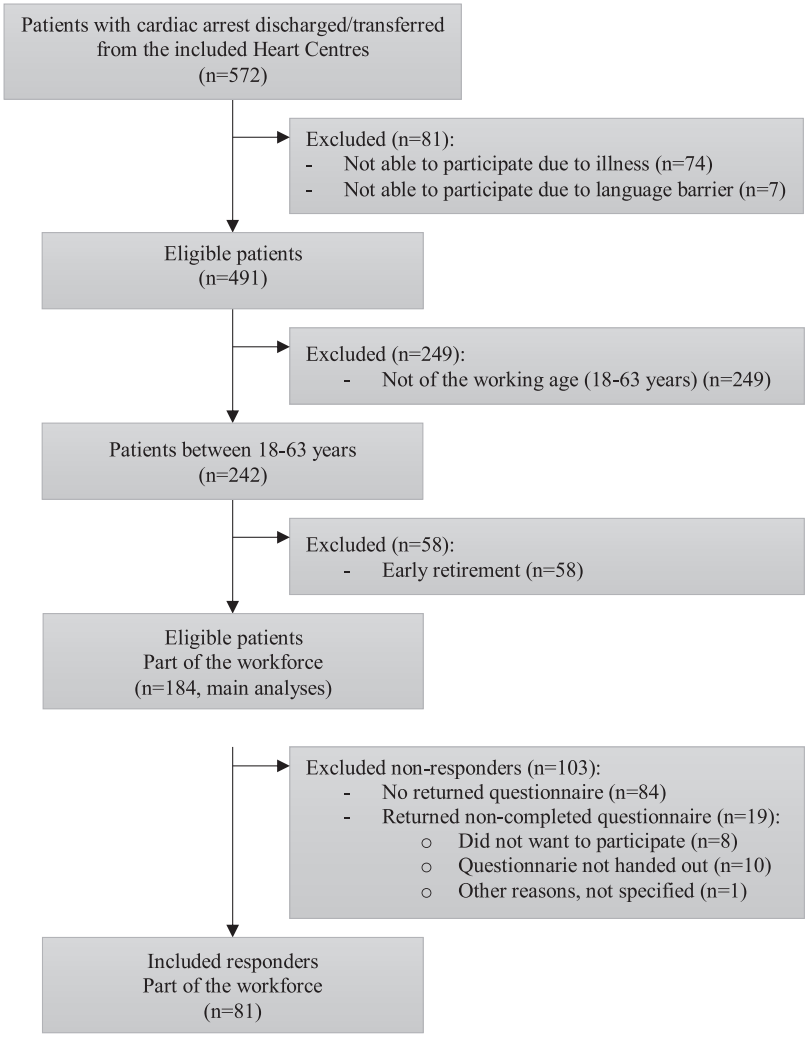

Fig. 1. Study Flowchart.

were still on paid sick leave and 69% (*n* = 127) had returned to work) (Fig. 2).

Prolonged sick leave was experienced by 55% (*n* = 102) of the patients at 3 months and 60% (*n* = 111) at 12 months (not shown in Table/Figure).

Characteristics associated with prolonged sick leave or leaving the workforce

Among the total workforce population (*n* = 184), age (per one year older) increased the odds of the composite endpoint of prolonged sick leave or leaving the workforce at 3 months after discharge (OR 1.06 95% CI 1.03–1.10) and at 12 months after discharge (OR 1.06 95% CI 1.03–1.09). Sex, marital status, educational level or co-morbidities (heart failure, arrhythmias or ischemic heart disease) were not associated with the composite endpoint of prolonged sick leave and leaving the workforce at 3 and 12 months (Table 3).

Among the responders (*n* = 81), self-reported health (HRQoL, anxiety and depression) were not associated with the composite endpoint of prolonged sick leave and leaving the workforce at 3 and 12 months (Table 4).

Discussion

The current study demonstrated sick leave patterns following OHCA, with one-fifth of the survivors at a working age before the OHCA still on paid sick leave after 12 months. Similarly, we found increasing age to be a significant characteristic when investigating characteristics associated with a composite endpoint of prolonged sick leave or leaving the workforce within 3 and 12 months.

After 12 months, 69% of the population had returned to the workforce, similar to findings by Kearney et al.[11] and Descatha et al. ,[12] with proportions of return to work of 73% and 65%, respectively. Despite different sick leave policies in the three studies (Denmark, Australia[11] and France[12]), it is worth highlighting how the proportions of survivors returning to work after 12 months were similar. With paid sick leave and reimbursement strategies for the employer in the current Danish population,[19,20] we might have expected this to influence the proportion of survivors returning to work. But, after 12 months, this does not seem to be the case. Still, we speculate how unpaid sick leave might lead to an early return in countries with different policies and acknowledge how this could influence the results.

Interestingly, we demonstrated how increasing age was associated with the composite endpoint of prolonged sick leave or leaving the workforce at 3 and 12 months among the total workforce population. Higher age is a natural characteristic for leaving the workforce after a severe event caused by illness, as demonstrated by others.[11,30] But, although reaching retirement age is a natural cause of leaving the workforce, a recent qualitative study by Dainty et al. has explored OHCA survivors' perspectives indicating that the OHCA has led to deliberate changes and redirections in life, and, for some, this meant withdrawal from work as a positive necessary step.[31] The

Table 1
Sociodemographic and clinical characteristics among OHCA survivors in the total workforce population, and divided responders and non-responders (n = 184).

	Total workforce population	All patients part of the workforce[a]		
		Responders	Non-responders	p[b]
N	184	81	103	
Sex, male, n (%)	139 (76)	63 (78)	76 (74)	0.532
Age, median (IQR)	51 (43–57)	49 (40–56)	51 (44–58)	<0.001
Married, n (%)	110 (60)	52 (64)	58 (56)	0.279
Educational level, n (%)				
Basic school	41 (23)	11 (14)	30 (31)	0.036
Upper secondary or vocational school	92 (53)	44 (57)	48 (49)	
Higher education	42 (24)	22 (29)	20 (20)	
Primary diagnosis, n (%)				
Cardiac arrest with successful resuscitation	105 (57)	39 (48)	66 (64)	<0.001
Cardiac arrest without specifications	18 (10)	<5	14 (14)	
Ventricular flutter or fibrillation	42 (23)	23 (28)	19 (18)	
Ventricular fibrillation	19 (10)	15 (19)	<5	
Co-morbidity, 10 years back, n (%)				
Hypertension	24 (13)	10 (12)	14 (14)	0.803
Ischaemic heart disease	37 (20)	17 (21)	20 (19)	0.792
Myocardial infarction	22 (12)	12 (15)	10 (10)	0.289
Heart failure	27 (15)	14 (17)	13 (13)	0.375
Previous PCI	25 (14)	12 (15)	13 (13)	0.666
Previous CABG	6 (3)	<5	<5	0.060
TU co-morbidity score, n (%)				
0	98 (53)	37 (46)	61 (59)	0.164
1	54 (29)	30 (37)	24 (23)	
2+	32 (17)	14 (17)	18 (17)	
Health behavior, n (%)[c]				
BMI ≥ 25	53 (70)	53 (70)	N/A	
BMI ≥ 30	18 (24)	18 (24)	N/A	
Current daily smoker	9 (11)	9 (11)	N/A	
Alcohol intake above high risk limit	<5	<5	N/A	

BMI Body Mass Index, *CABG* coronary artery bypass grafting, *IQR* interquartile range, *PCI* percutaneous coronary intervention.
[a] All patients in a working age, 18–63 years (n = 184), divided into responders and non-responders.
[b] The p value was set at a 5% significance level.
[c] Information about BMI, smoking and alcohol consumption is based on self-reported data from DenHeart, and therefore presented only for responders (n = 176/n = 81).

participants in the study by Dainty et al. described how life had gained a new purpose: some were involved in volunteering, participated in the research, trained others in cardiopulmonary resuscitation and similar things related to the OHCA, whereas others again withdrew from the workforce to focus their time and energy on family, loved ones and other types of networks.[31] Thus, worth highlighting is, that returning to the workforce is not a primary goal for all people.

Prolonged sick leave occurred among 55% and 60% of the working population at 3 months and 12 months, respectively. Thus, we speculate how fatigue, cognitive impairment and reduced physical and mental health might lead to an increased period of sick leave, as seen in other studies.[3,31] To support this, the proportion of the working population with symptoms of anxiety was 33%, and therefore higher than we previously reported in another subpopulation of OHCA survivors of the DenHeart study (28%, with survivors both being part of the workforce before the OHCA and not).[32] This demonstrates how a younger working population might experience a higher burden of anxiety. Being mentally burdened after discharge might potentially influence working capacity, as working is a crucial marker of recovery among many OHCA survivors.[31] Returning to work can, for the survivors, be seen as a way of reconnecting to the personal traits as before the arrest[31] why it is crucial to detect mental symptoms that might influence the ability to work - to support the survivors in resuming their daily life.

Table 2
Self-reported health measured among responders of the working population (n = 81).

	Workforce population, responders n = 81
Hospital Anxiety and Depression Scale, HADS	
HADS-*A* ≥ 8, n (%)	25 (33)
HADS-A, median (IQR)	5.0 (3.0–9.0)
HADS-*D* ≥ 8, n (%)	12 (17)
HADS-D, median (IQR)	3.0 (1.0–5.5)
HeartQol	
Global Score, median (IQR)	2.07 (1.28–2.78)
Physical subscale score, median (IQR)	2.00 (1.20–2.80)
Emotional subscale score, median (IQR)	2.50 (1.66–3.00)

Thus, the study has several implications for clinical practice and future research. First, to support OHCA survivors in resuming the workforce, targeted follow-up and rehabilitation following discharge are essential. As highlighted in a recently published study by Christensen et al., a more integrated rehabilitation program is needed to target OHCA survivors.[7] In line with others,[33] the authors suggest a rehabilitation program to include regular cardiac rehabilitation, but also neurological rehabilitation and psychological treatment to support the survivors in resuming work.[7] Similarly, this leads to implications for future research with an urgent need for new rehabilitation programmes for OHCA survivors to be developed and tested in randomized, controlled trials to investigate the effect on overall outcomes, including work status. In addition, more knowledge on factors associated with not returning to work is needed, as these elements might guide rehabilitation interventions and clinical practice.

Despite high proportions of symptoms of anxiety and depression at discharge, we did not find a significant association between these elements and the composite endpoint. However, this is presumable due to the low sample size of the subpopulation of responders, and

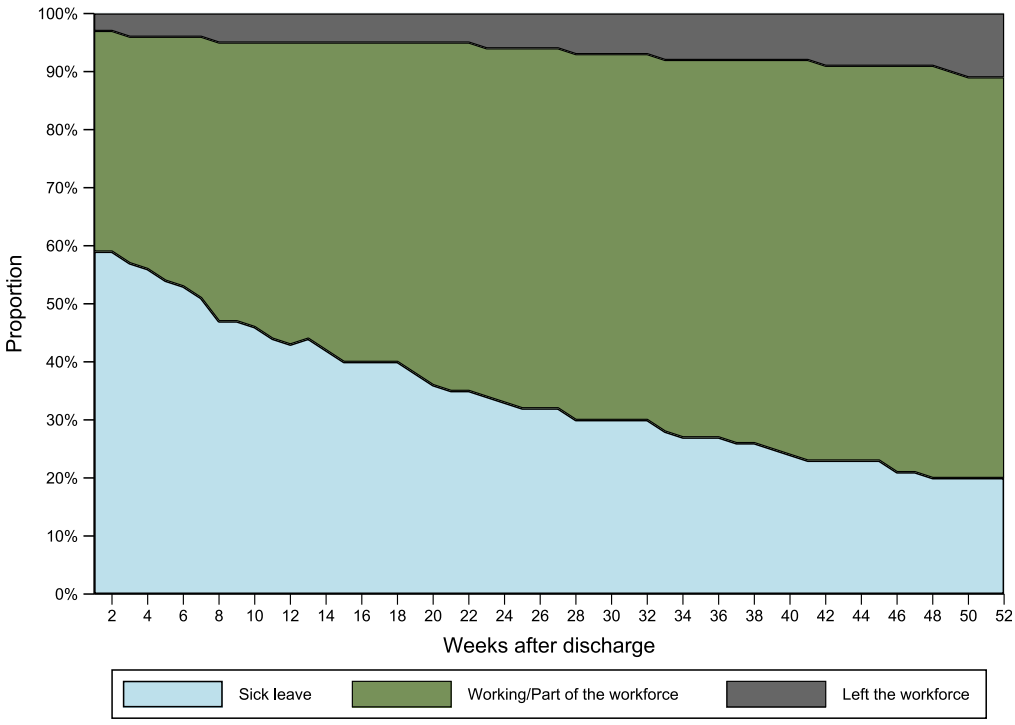

Fig. 2. Labor market affiliation from discharge to 12 months

Total number of patients being part of the workforce (n = 184) and differences in proportions being on sick leave, working/part of the workforce or out of the workforce at a weekly basis up to 52 weeks after discharge.

Table 3
The association between clinical and sociodemographic characteristics and the composite endpoint of prolonged sick leave and leaving the workforce at 3 months and 12 months.

	3 months		12 months	
	Unadjusted OR (95% CI)	Adjusted* OR (95% CI)	Unadjusted OR (95% CI)	Adjusted* OR (95% CI)
Sex, female	0.71 (0.36–1.38)	1.06 (0.51–2.23)	0.61 (0.31–1.19)	0.89 (0.43–1.88)
Age, years	1.06 (1.03–1.09)	**1.06 (1.03–1.10)**	1.06 (1.03–1.09)	**1.06 (1.03–1.09)**
Being unmarried	0.40 (0.23–0.73)	0.52 (0.27–1.02)	0.40 (0.22–0.74)	0.54 (0.28–1.03)
Educational level				
Basic school	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Upper secondary/vocational school	1.70 (0.81–3.59)	1.83 (0.82–4.08)	1.54 (0.72–3.29)	1.62 (0.72–3.67)
Higher education	0.87 (0.37–2.05)	0.79 (0.31–1.10)	0.71 (0.30–1.69)	0.63 (0.25–1.61)
Co-morbidity 10 years back				
Heart failure	0.71 (0.31–1.61)	1.60 (0.53–4.82)	0.95 (0.41–2.18)	2.50 (0.80–7.81)
Arrythmias	0.48 (0.26–0.90)	0.63 (0.26–1.57)	0.47 (0.25–0.89)	0.57 (0.27–1.44)
Ischemic Heart Disease	0.93 (0.45–1.92)	0.71 (0.31–1.65)	0.96 (0.46–1.99)	0.67 (0.28–1.58)

* The analyses are adjusted for sex, age and Tu co-morbidity index.

Table 4
The association between health-related quality of life, anxiety and depression and the composite endpoint of prolonged sick leave and leaving the workforce at 3 months and 12 months.

	3 months		12 months	
	Unadjusted OR (95% CI)	Adjusted* OR (95% CI)	Unadjusted OR (95% CI)	Adjusted* OR (95% CI)
HADS-*A* ≥ 8 vs < 8	0.44 (0.16–1.19)	0.31 (0.10–1.25)	0.57 (0.22–1.50)	0.45 (0.15–1.35)
HADS-*D* ≥ 8 vs < 8	1.50 (0.42–5.25)	1.60 (0.42–6.05)	1.87 (0.51–6.88)	2.04 (0.51–8.18)
HeartQol Global**	1.36 (0.79–2.36)	1.58 (0.86–2.92)	1.22 (0.71–2.10)	1.34 (0.73–2.45)
HeartQol Physical**	1.20 (0.73–1.96)	1.30 (0.75–2.23)	1.12 (0.68–1.82)	1.16 (0.68–2.00)
HeartQol Emotional**	1.58 (0.96–2.66)	2.04 (1.11–3.74)	1.36 (0.83–2.24)	1.62 (0.92–2.86)

* The analyses are adjusted for sex, age and Tu co-morbidity index.
** Per one-point increase.

we suggest future studies to investigate these perspectives more thoroughly.

Strengths and limitations

The study was conducted as a large, national multicenter study including patient-reported outcomes of OHCA survivors at discharge linked with register-based data. This enabled a complete dataset, including information on both responders and non-responders. The non-responders were older, had a lower educational level, and had a different primary diagnosis/cause of the cardiac arrest. In addition, the analyses were performed on a small population which might cause a problem in the regression analyses due to the lack of statistical power. The clinical data were obtained based on national registries, but data related to, e.g. intensive care unit was unavailable. These data would have strengthened the study.

When investigating the return to work, we used the DREAM register. This is both a main strength and a limitation of the study. The strength is that the registration is built on all entries of sick leave compensations. We expect these to be accurate as they are dependent on employers claiming compensation refunds (economic incentives). Contrary, a limitation is the inclusion of sick leave of more than two weeks. This means that short-term absence from work is not included. Similarly, the register do not distinguish between full- and part-time sick leave.[20,21] Knowledge about job type and strain would also have been relevant but not available through the registries.

We limited the population to OHCA survivors between 18 and 63 years. We acknowledge, though, how survivors above the age of 63 might be working too, but the age limit was set to ensure that no patients received state pension during the follow-up period.

To conclude, one-fifth of the OHCA survivors at a working age prior to the OHCA were still on paid sick leave after 12 months. Increasing age was associated with a composite endpoint of prolonged sick leave or leaving the workforce at 3 and 12 months after discharge. In contrast, self-reported health at discharge, covering HRQoL, symptoms of anxiety and depression was not. With increasing survival rates following OHCA, healthcare professionals need to support the population in resuming daily life, including returning to the workforce, when relevant. Thus, knowledge of prolonged sick leave and the risk of not returning to the workforce following OHCA adds to the current evidence stating the need for targeted rehabilitation.

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Data availability statement

The data used in this article cannot be shared publicly due to Danish Law.

Declaration of Competing Interest

None

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References

1. Whitehead L, Perkins GD, Clarey A, Haywood KL. A systematic review of the outcomes reported in cardiac arrest clinical trials: the need for a core outcome set. *Resuscitation*. 2015;88(March):150–157. https://doi.org/10.1016/j.resuscitation.2014.11.013.
2. Gräsner JT, Herlitz J, Tjelmeland IBM, et al. European Resuscitation Council Guidelines 2021: epidemiology of cardiac arrest in Europe. *Resuscitation*. 2021;161 (April):61–79. https://doi.org/10.1016/j.resuscitation.2021.02.007.
3. Lilja G, Nielsen N, Bro-Jeppesen J, et al. Return to work and participation in society after out-of-hospital cardiac arrest. *Circ Cardiovasc Qual Outcomes*. 2018;11(1 January): e003566. https://doi.org/10.1161/CIRCOUTCOMES.117.003566.
4. Garland A, Jeon SH, Stepner M, et al. Effects of cardiovascular and cerebrovascular health events on work and earnings: a population-based retrospective cohort study. *CMAJ*. 2019;191(1 January):E3–E10. https://doi.org/10.1503/cmaj.181238. 7.
5. Steinbusch CVM, van Heugten CM, Rasquin SMC, Verbunt JA, Moulaert VRM. Cognitive impairments and subjective cognitive complaints after survival of cardiac arrest: a prospective longitudinal cohort study. *Resuscitation*. 2017;120(November):132–137. https://doi.org/10.1016/j.resuscitation.2017.08.007.
6. Moulaert VRM, van Heugten CM, Gorgels TPM, Wade DT, Verbunt JA. Long-term outcome after survival of a cardiac arrest: a prospective longitudinal cohort study. *Neurorehabil Neural Repair*. 2017;31(6 June):530–539. https://doi.org/10.1177/1545968317697032.
7. Christensen J, Winkel BG, Eskildsen SJ, Gottlieb R, Hassager C, Wagner MK. Return-to-work and rehabilitation needs in cardiac arrest survivors: an exploratory cross-sectional study. *Eur J Cardiovascul Nurs: J Work Gr Cardiovascul Nurs Eur Soc Cardiol*. 2022. https://doi.org/10.1093/eurjcn/zvac039. Jun 29.
8. Geri G, Dumas F, Bonnetain F, et al. Predictors of long-term functional outcome and health-related quality of life after out-of-hospital cardiac arrest. *Resuscitation*. 2017;113(April):77–82. https://doi.org/10.1016/j.resuscitation.2017.01.028.
9. Bohm M, Lilja G, Finnbogadottir H, et al. Detailed analysis of health-related quality of life after out-of-hospital cardiac arrest. *Resuscitation*. 2019;135(February):197–204. https://doi.org/10.1016/j.resuscitation.2018.10.028.
10. Lilja G, Nilsson G, Nielsen N, et al. Anxiety and depression among out-of-hospital cardiac arrest survivors. *Resuscitation*. 2015;97(December):68–75. https://doi.org/10.1016/j.resuscitation.2015.09.389.
11. Kearney J, Dyson K, Andrew E, Bernard S, Smith K. Factors associated with return to work among survivors of out-of-hospital cardiac arrest. *Resuscitation*. 2020;146 (January):203–212. https://doi.org/10.1016/j.resuscitation.2019.09.006. 1.
12. Descatha A, Dumas F, Bougouin W, Cariou A, Geri G. Work factors associated with return to work in out-of-hospital cardiac arrest survivors. *Resuscitation*. 2018;128 (July):170–174. https://doi.org/10.1016/j.resuscitation.2018.05.021.
13. Berg SK, Svanholm J, Lauberg A, et al. Patient-reported outcomes at hospital discharge from Heart Centres, a national cross-sectional survey with a register-based follow-up: the DenHeart study protocol. *BMJ Open*. 2014;4(5 May): e004709. https://doi.org/10.1136/bmjopen-2013-004709. 2,.
14. ICD-10. Chapter IX - Diseases of the circulatory system. https://icd.who.int/browse10/2016/en#/I30-I52.
15. Lynge E, Sandegaard JL, Rebolj M. The Danish National Patient Register. *Scand J Public Health*. 2011;39(7 Suppl July):30–33. https://doi.org/10.1177/1403494811401482.
16. Pedersen CB. The Danish Civil Registration System. *Scand J Public Health*. 2011;39(7 Suppl July):22–25. https://doi.org/10.1177/1403494810387965.
17. Jensen VM, Rasmussen AW. Danish Education Registers. *Scand J Public Health*. 2011;39(7 Suppl July):91–94. https://doi.org/10.1177/1403494810394715.
18. Tu JV, Austin PC, Walld R, Roos L, Agras J, McDonald KM. Development and validation of the Ontario acute myocardial infarction mortality prediction rules. *J Am Coll Cardiol*. 2001;37(4 March):992–997. 15.
19. Pedersen P, Lund T, Lindholdt L, et al. Labour market trajectories following sickness absence due to self-reported all cause morbidity—a longitudinal study. *BMC Public Health*. 2016;16(April):337. https://doi.org/10.1186/s12889-016-3017-x. 16.
20. Stapelfeldt CM, Jensen C, Andersen NT, Fleten N, Nielsen CV. Validation of sick leave measures: self-reported sick leave and sickness benefit data from a Danish national register compared to multiple workplace-registered sick leave spells in a Danish municipality. *BMC Public Health*. 2012;12(August):661. https://doi.org/10.1186/1471-2458-12-661. 15.
21. Hjollund NH, Larsen FB, Andersen JH. Register-based follow-up of social benefits and other transfer payments: accuracy and degree of completeness in a Danish interdepartmental administrative database compared with a population-based survey. *Scand J Public Health*. 2007;35(5):497–502. https://doi.org/10.1080/14034940701271882.
22. Oldridge N, Hofer S, McGee H, Conroy R, Doyle F, Saner H. The HeartQoL: part I. Development of a new core health-related quality of life questionnaire for patients with ischemic heart disease. *Eur J Prev Cardiol*. 2014;21(1 January):90–97. https://doi.org/10.1177/2047487312450544.
23. Oldridge N, Hofer S, McGee H, Conroy R, Doyle F, Saner H. The HeartQoL: part II. Validation of a new core health-related quality of life questionnaire for patients with ischemic heart disease. *Eur J Prev Cardiol*. 2014;21(1 January):98–106. https://doi.org/10.1177/2047487312450545.
24. Oldridge N, Saner H, McGee HM, HeartQo LSI. The Euro Cardio-QoL Project. An international study to develop a core heart disease health-related quality of life questionnaire, the HeartQoL. *Eur J Cardiovasc Prev Rehabil*. 2005;12(2 April):87–94. https://doi.org/10.1097/01.hjr.0000159408.05180.0e.

25. Zigmond AS, Snaith RP. The hospital anxiety and depression scale. *Acta Psychiatr Scand*. 1983;67(6 June):361–370.
26. De Smedt D, Clays E, Hofer S, et al. Validity and reliability of the HeartQoL questionnaire in a large sample of stable coronary patients: the EUROASPIRE IV Study of the European Society of Cardiology. *Eur J Prev Cardiol*. 2016;23(7 May):714–721. https://doi.org/10.1177/2047487315604837.
27. Christensen AV, Dixon JK, Juel K, et al. Psychometric properties of the Danish Hospital Anxiety and Depression Scale in patients with cardiac disease: results from the DenHeart survey. *Health Qual Life Outcome*. 2020;18(1 January):9. https://doi.org/10.1186/s12955-019-1264-0. 7.
28. Berg SK, Rasmussen TB, Thrysoee L, et al. DenHeart: differences in physical and mental health across cardiac diagnoses at hospital discharge. *J Psychosom Res*. 2017;94(March):1–9. https://doi.org/10.1016/j.jpsychores.2017.01.003.
29. World Medical A. World Medical Association Declaration of Helsinki: ethical principles for medical research involving human subjects. *JAMA*. 2013;310(20 November):2191–2194. https://doi.org/10.1001/jama.2013.281053. 27.
30. Kragholm K, Wissenberg M, Mortensen RN, et al. Return to work in out-of-hospital cardiac arrest survivors: a Nationwide Register-Based Follow-Up Study. *Circulation*. 2015;131(19 May):1682–1690. https://doi.org/10.1161/circulationaha.114.011366. 12,.
31. Dainty KN, Bianca Seaton M, Richard Verbeek P. Moving from physical survival to psychologic recovery: a qualitative study of survivor perspectives on long-term outcome after sudden cardiac arrest. *Resusc Plus*. 2021;5(March): 100055. https://doi.org/10.1016/j.resplu.2020.100055.
32. Wagner MK, Christensen AV, Hassager C, et al. Sex differences in patient-reported outcomes in the immediate recovery period after resuscitation: findings From the Cross-sectional DenHeart Survey. *J Cardiovasc Nurs*. 2022(April). https://doi.org/10.1097/JCN.0000000000000914. 28.
33. Babu AS. Rehabilitation following return of spontaneous circulation (ROSC-Rehab): a new role for rehabilitation professionals in post-resuscitation care. *Resuscitation*. 2021;159(February):38–39. https://doi.org/10.1016/j.resuscitation.2020.12.011.