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Clinical paper

Health-related quality of life after surviving an out-of-hospital compared to an in-hospital cardiac arrest: A Swedish population-based registry study

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Abstract

Background: Health-related quality of life (HRQoL) has been reported for out-hospital (OHCA) and in-hospital cardiac arrest (IHCA) separately, but potential differences between the two groups are unknown. The aim of this study is therefore to describe and compare HRQoL in patients surviving OHCA and IHCA.

Methods: Patients ≥18 years with Cerebral Performance Category 1–3 included in the Swedish Registry for Cardiopulmonary Resuscitation between 2014 and 2017 were included. A telephone interview was performed based on a questionnaire sent 3–6 months post cardiac arrest, including EQ-5D-5L and the Hospital Anxiety and Depression Scale. Mann–Whitney *U* test and multiple linear- and ordinal logistic regression analyses were used to describe and compare HRQoL in OHCA and IHCA survivors. Adjustments were made for sex, age and initial rhythm.

Results: In all, 1369 IHCA and 772 OHCA survivors were included. Most OHCA and IHCA survivors reported no symptoms of with anxiety (88% and 84%) or depression (87% and 85%). IHCA survivors reported significantly more problems in the health domains mobility, self-care, usual activities and pain/discomfort ($p < 0.001$ for all) and scored lower general health measured by EQ-VAS (median 70 vs. 80 respectively, $p < 0.001$) compared with the OHCA survivors.

Conclusion: Survivors of IHCA reported significantly worse HRQoL compared to survivors of OHCA. Consequently, research data gathered from one of these populations may not be generalizable to the other.

Keywords: Health, Heart arrest, Psychological distress, Quality of life

Abbreviations: IHCA, in-hospital cardiac arrest; OHCA, out-of-hospital cardiac arrest; CPR, cardiopulmonary resuscitation; VT, ventricle tachycardia; VF, ventricle fibrillation; PEA, pulseless electric activity; HRQoL, health-related quality of life.

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https://doi.org/10.1016/j.resuscitation.2020.04.002
Received 3 February 2020; Received in revised form 29 March 2020; Accepted 2 April 2020

Introduction

Outcome following cardiac arrest has primarily been reported in terms of mortality or with crude functional outcome scales such as the Cerebral Performance Category (CPC) scale. However, other outcomes such as health-related quality of life (HRQoL) may be more relevant from the patient perspective.[1] Furthermore, the International Liaison Committee on Resuscitation and the COSCA (Core Outcome Set for Cardiac Arrest) group have recommended HRQoL as a core outcome in cardiac arrest trials.[2,3] In previous studies including HRQoL measures, most survivors have reported a good HRQoL.[4,5] Nevertheless, cognitive, emotional and physical problems are common and restricts the survivor's life and ability to participate in societal activities.[6,7]

Whether a cardiac arrest occurs outside or within a hospital has a fundamental impact on survival, i.e. national overall survival rates in Sweden are 35% for IHCA and 10% for OHCA.[8,9] Except for better survival, IHCA survivors are in general older and the time between the arrest and defibrillation is much shorter.[10] Both these factors may be of significant importance for HRQoL but few studies have compared the two groups. Individual studies on IHCA and OHCA survivors respectively have concluded that HRQoL in general are good and comparable to general populations.[4,5,11] Lack of consistence in design, time for follow-up and measures make it difficult to draw any strong conclusions about differences in HRQoL between IHCA and OHCA survivors. However, some differences have been demonstrated in two of the largest HRQoL studies in cardiac arrest survivors made so far by Smith et al.[5] (OHCA) and Israelsson et al.[4] (IHCA). Based on EQ-5D, these studies conclude that pain is a common health problem. However, Smith et al.[5] reported problems with self-care as most common and anxiety and depression as less common in OHCA survivors. Israelsson et al.[4] reported the opposite, except for pain, problems with anxiety and depression were most common while problems with self-care were least common in IHCA survivors. However, both studies have different follow-up time and was conducted in two countries with different health care systems. To improve post cardiac arrest care, it is of importance to extend the knowledge about HRQoL in IHCA and OHCA. Therefore, the aim was to describe and compare HRQoL in patients surviving OHCA and IHCA in a nationwide population-based study.

Methods

Study design and settings

This registry-based study was conducted in Sweden from 1st January 2014 to 31st December 2017. Nearly 100% of all patients suffering from OHCA and where resuscitation was attempted are included in the web-based Swedish Register of Cardiopulmonary Resuscitation. Similarly, 95% ($n = 73$) of all hospitals with intrahospital resuscitation teams reported IHCA to the registry. Inclusion criteria for the registry are according to Utstein guidelines and defined as *"a hospitalised patient who is unresponsive with apnoea (or agonal, gasping respiration) where CPR and/or defibrillation has been initiated."* Patients are categorized as OHCA if the event has taken place outside hospital and IHCA if the event occurred while the patient was within the walls of a hospital. The Swedish Register of Cardiopulmonary Resuscitation is linked to the Swedish Total Population Registry, held by the National Board of Health and Welfare, from which vital status data are automatically retrieved and updated several times per week. This allows for complete follow-up for survival status of all participants.[12] Data is entered into the registry on three occasions, similarly for OHCA and IHCA. The first and second registration occurs in close proximity to the cardiac arrest and includes data on patient characteristics (e.g., age and sex), cardiac arrest characteristics and treatments, post resuscitation care, survival and CPC-score. Starting in August 2013 a third registration is performed on survivors six months (time window ± three months) after resuscitation, including HRQoL assessments. The present study is mainly based on this third registration.

Procedure and participants

All survivors, 18 years or older, alive at three months after their cardiac arrest were manually screened for eligibility to participate in HRQoL assessments by registry nurses. Criteria for exclusion were: unwillingness to participate, severe cognitive dysfunction, language difficulties, and severe physical and/or psychological difficulties (according to the latest medical file). However, survivors with severe cognitive disability could be included if PROXY raters, e.g., a spouse, could be identified. The remaining patients were sent an invitation letter and a questionnaire including the EQ-5D-5L and the Hospital Anxiety and Depression Scale (HADS) to their home address. The letter includes information about the registry and an invitation to a telephone follow-up interview where their responses to the questionnaires were collected. The follow-up interviews were performed by resuscitation coordinators or cardiac rehabilitation nurses depending on hospital organization. In addition, a scoring of cerebral function according to CPC is conducted based on information from the conversation and/or patient records.

Measures of health-related quality of life

Generic health status (EQ-5D-5L)

The EQ-5D-5L is a generic measure of self-reported health status and consists of five health-dimensions: mobility, self-care, usual activities, pain/discomfort and anxiety/depression. Each dimension has five response options, from no problems (1), to extreme problems (5). The EQ-5D-5L also includes a separate measure of general health, called the EQ VAS, where the respondents rate their own perception of their current health on a vertical scale from "the worst health you can imagine" (0) to "the best health you can imagine" (100). The EQ-5D-5L has shown good measurement properties in terms of validity and reliability and has previously been used in cardiac arrest populations.[7,13] In addition, it is recommended in the COSCA advisory statement.[2]

Hospital Anxiety and Depression Scale

The HADS is a symptom specific measure developed to detect symptoms of anxiety and depression.[14] It consists of 14 items, of which seven correlates with anxiety and seven correlates with depression. Each item has four response categories, from 0 to 3. The responses for the items within each domain are summed, with a possible score range between 0 and 21 for anxiety and depression respectively. Higher scores indicate more severe symptoms of anxiety and/or depression. Different cut-off levels have been suggested.[15] In the present study the following were used: normal (0–7), mild (8–10), moderate (11–14), and severe (15–21).[16] The HADS has shown good measurement properties for medical patients[17] and has been used in cardiac arrest research.[4,7]

Statistical analyses

Univariate statistics were used to describe the characteristics of patients and study variables. To test for group differences, Pearson chi-square test or Mann–Whitney *U* test were conducted, based on type and distribution of data. To compare HRQoL between OHCA and IHCA survivors, Person chi-square test were used for nominal data and Mann–Whitney *U* test for ordinal data. Regression analyses were conducted to control for age and sex differences. Multiple linear regression was used when EQ VAS and HADS subscale scores were used as outcome variables. To handle the ordinal nature of data, multiple generalized logistic regression for ordinal dependent variables (unconstrained proportional odds model) was used when EQ-5D health dimensions were the outcome variables. In all regression models, type of cardiac arrest (OHCA vs. IHCA) was used as the explanatory variable while age, sex and initial rhythm were included as adjusting covariates. Initial rhythm was grouped into shockable (VT and VF), non- shockable (asystole and PEA) and "unknown", and then entered into the models as dummy variables with shockable rhythm as reference category. The level of statistical significance was set at $p < 0.05$. All analyses were performed with Stata 16.0 for Windows (Stata Corp LLC, College Station, TX, USA).

Table 1 – Characteristics of 2141 Swedish patients surviving 6 months after cardiac arrest during 2014–2017.

	OHCA, *n* = 772	IHCA, *n* = 1369	*p*-value[a]
Sex, *n* (%)			
Men	599 (77.6)	888 (64.9)	<0.001
Age (years), Mean (SD)	63 (14)	69 (13)	<0.001
Age category, *n* (%)			<0.001
18–30	22 (2.9)	18 (1.3)	
31–40	34 (4.4)	16 (1.2)	
41–50	80 (10.4)	92 (6.7)	
51–60	160 (20.7)	195 (14.3)	
61–70	237 (30.7)	377 (27.6)	
71-80	169 (21.9)	439 (32.1)	
>80	70 (9.1)	208 (16.9)	
Co-morbidities, *n* (%)			NA
Diabetes	–	313 (22.8)	
Previous myocardial infarction	–	318 (23.2)	
Cancer	–	176 (12.8)	
Place of cardiac arrest, *n* (%)			NA
Home	325 (42.1)	–	
Public place	276 (35.8)	–	
Patient ward	–	310 (22.6)	
Cardiac ward/High Dependency Unit	–	316 (23.1)	
Intensive care unit	–	131 (9.5)	
Operating/procedure rooms	–	105 (7.7)	
Angio cath lab	–	281 (20.5)	
Emergency Department	–	182 (13.2)	
Others	171 (22.2)	34 (2.5)	
Witnessed cardiac arrest, *n* (%)			<0.001
Yes	692 (89.6)	1282 (93.6)	
Missing	6 (<1)	19 (1.4)	
Bystander CPR, *n* (%)			NA
Yes	399 (51.7)	–	
Initial documented heart rhythm, *n* (%)			<0.001
VT/VF	563 (72.9)	717 (52.4)	
PEA	45 (5.8)	130 (9.5)	
Asystole	44 (5.7)	284 (20.7)	
Missing	123 (15.9)	238 (17.4)	
Presumed etiology, *n* (%)			<0.001
Cardiac	597 (77.3)	914 (66.8)	
Hypothermia/target temperature management, *n* (%)		<0.001	
Yes	13 (1.6)	79 (5.8)	
Cerebral Performance Category at discharge, *n* (%)			0.19
1	568 (73.6)	989 (72.2)	
2	105 (13.6)	132 (9.6)	
3	30 (3.9)	47 (3.4)	
4–5	5 (<1)	5 (<1)	
Missing	60 (7.8)	175 (12.8)	

[a] Pearson chi-square test.

Ethics

All survivors are informed per mail about their participation in the Swedish Register of Cardiopulmonary Resuscitation and can at any time withdraw their consent to participate in the registry. Since the start of the registry in 1990 only a handful of patients have withdrawn their participation. This study was approved by the Regional Ethical Review Board in Stockholm, Sweden, No. 2013/1959-31/4.

Results

Patient characteristics

In all, 772 OHCA survivors and 1,369 IHCA survivors in Sweden during 2014–2017 were included. The response rates were 55% (772 out of 1415 survivors) for OHCA survivors and 57% (1369 out of 2384 survivors) for IHCA survivors in the Swedish Register of Cardiopulmonary Resuscitation. Reasons to not participate were as following for OHCA ($n = 643$) and IHCA ($n = 1015$) respectively: Unknown 277 (43%) and 531 (52%), other reason 184 (29%) and 245 (24%), unwillingness to participate 68 (11%) and 92 (9%), severe cognitive dysfunction 46 (7%) and 77 (8%), language difficulties 14 (2%) and 49 (5%), deceased between inclusion and responses 54 (8%) and 21 (2%).

The proportion of males was higher among OHCA survivors than among IHCA survivors (78% and 65%, respectively, $p < 0.001$). Survivors of OHCA were in general 5 years younger than survivors of IHCA ($p < 0.001$). Thus, 18% of OHCA survivors were younger than 51 years compared to 9% of IHCA survivors and 9% of the OHCA survivors were at least 81 years old compared to 17% of IHCA survivors. Regardless the location for the CA, most survivors had suffered a witnessed cardiac arrest (90% OHCA vs. 94% IHCA, $p < 0.001$) and had a shockable recorded initial rhythm (73% OHCA vs. 52% IHCA, $p < 0.001$). At discharge, three quarters of the survivors had CPC 1, 74% for OHCA and 72% for IHCA (Table 1).

Generic health status (EQ-5D-5L)

The IHCA survivors reported significantly worse health status measured by EQ VAS compared to the OHCA survivors (median (IQR); 70 (50–80) vs. 80 (65–90), $p < 0.001$). Survivors of IHCA reported a significantly higher prevalence of problems with mobility (49% vs. 29%, $p < 0.001$), self-care (24% vs. 13%, $p < 0.001$), usual activities (52% vs. 41%, $p < 0.001$), and pain/discomfort (61% vs. 53%, $p < 0.001$) compared with survivors of OHCA. No significant differences in prevalence was detected for anxiety/depression (49% vs. 47%, $p = 0.28$) (Fig. 1). The survivors of IHCA also reported significantly higher mean scores, i.e. more health problems, in all dimensions ($p < 0.001$) except for anxiety/depression ($p = 0.24$) of EQ-5D-5L (Fig. 2). The regression analyses showed that the differences in health status remained after adjustment for age, sex and initial rhythm (Tables 2 and 3).

Anxiety and depression (HADS)

According to the cut-off levels, the vast majority of survivors of both OHCA and IHCA reported normal levels of symptoms of anxiety (88% vs. 84%, $p = 0.03$) and depression (87% vs. 85%, $p = 0.23$). Based on the HADS subscale scores, the IHCA survivors reported significantly higher levels of symptom severity in anxiety (median (IQR); OHCA 2 (0–5) vs. IHCA 2 (0–6), $p = 0.004$) and depression (median (IQR); OHCA 2 (0–4) vs. IHCA 2 (1–5), $p < 0.001$) compared with OHCA survivors (Fig. 3). The regression analyses showed that the difference in symptom severity of anxiety remained after adjustment for age, sex and initial rhythm. In contrast, no difference remained in symptom severity of depression in the adjusted regression models (Table 3).

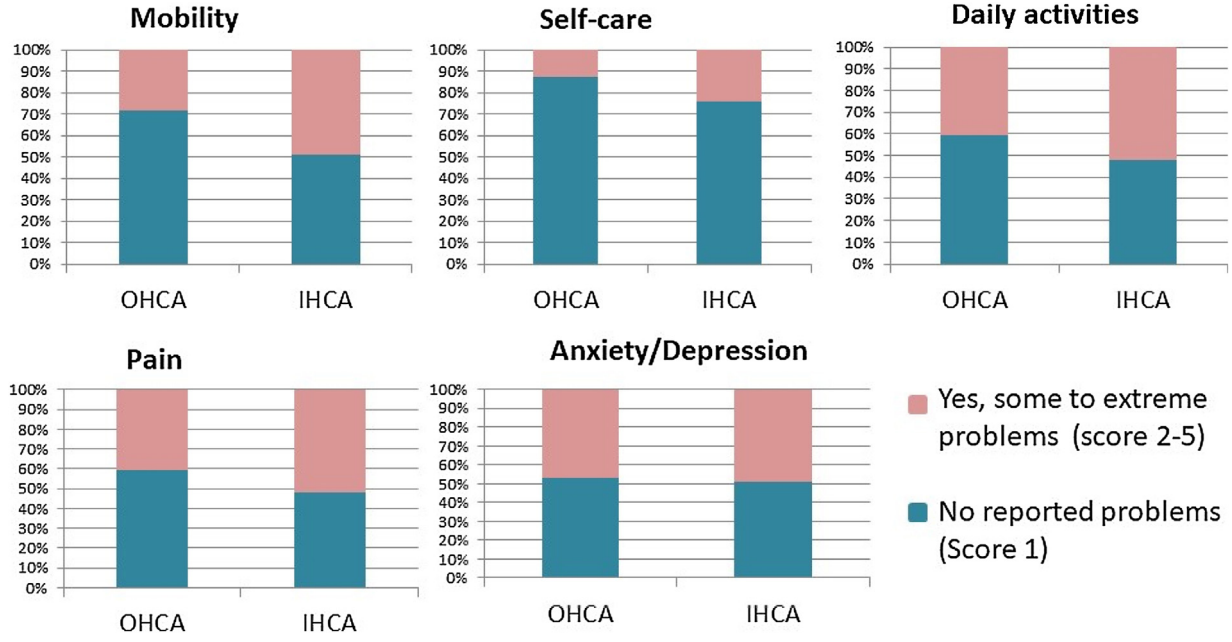

Fig. 1 – Distribution of answers in the domains of EQ-5D-5L 6 months after a cardiac arrest in Sweden during 2014–2017, separated for out-of-hospital cardiac arrest (OHCA) and in-hospital cardiac arrest (IHCA). All differences are significant ($p < 0.001$) except for anxiety/depression ($p = 0.282$).

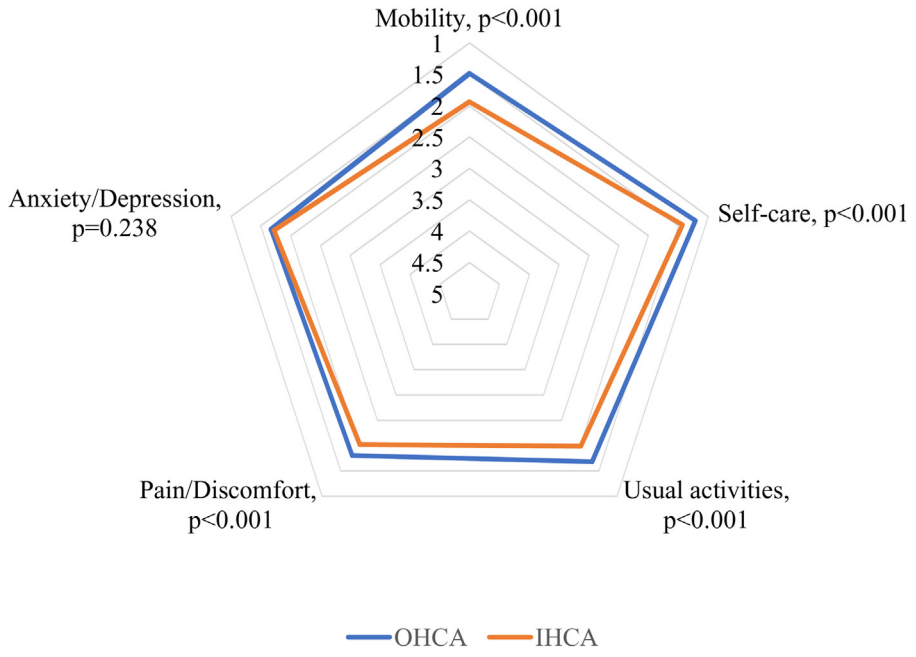

Fig. 2 – Mean differences in EQ-5D-5L 6 months after surviving an out-of-hospital cardiac arrest (OHCA) compared to an in-hospital cardiac arrest (IHCA) in Sweden during 2014–2017, analysed with Mann–Whitney *U* test.

Discussion

This national population-based HRQoL study is, so far, the largest among cardiac arrest survivors and the first that compares HRQoL between OHCA and IHCA survivors. The results show that survivors in general reported good HRQoL but with great individual variations. Moreover, OHCA survivors reported significantly better HRQoL compared to IHCA survivors.

In consistence with previous research in CA,[7] we found that survivors in general reported good HRQoL. A previous study by Israelsson et al.,[11] with both IHCA and OHCA survivors, showed that differences in HRQoL between survivors and an age and gender matched general population was small and that the survivors in some measures reported better HRQoL compare to the general population. Based on these findings, poor HRQoL seems not to be a general problem for cardiac arrest survivors. However, an important result from the present study is the large variation in HRQoL among the survivors regardless whether it took place in- or outside hospital. Thus, it is important to identify survivors at risk for poor HRQoL. Implementing assessments of HRQoL in post cardiac arrest follow-up care might constitute means to screen for those in need of support. In such a context, patients also reporting mild to severe problems with anxiety and depression at HADS or any other measure might be identified and receive appropriate treatment. In order to better identify survivors at risk of poor HRQoL, longitudinal studies searching for predictor variables are required.

Our main finding is that IHCA survivors reported significantly lower HRQoL compared to survivors of OHCA (except for symptoms of depression). Although no previous study have compared HRQoL between OHCA and IHCA survivors at the same time and with the same measures, this finding are consistent with large cardiac arrest studies by Smith et al.[5] and Israelsson et al.,[4] which both used EQ VAS as a measure of HRQoL. These studies showed that OHCA survivors had a median score of 75 in EQ VAS[5] compared to 70 in IHCA survivors.[4] It is reasonable to assume that IHCA survivors suffer from more extensive comorbidity than OHCA survivors since the former group is older, which may explain this difference in HRQoL between the two groups. Moreover, patients who suffer from an IHCA are hospitalized for a reason, i.e. a disease that may have a synergistic negative impact on HRQoL in contrast to suffering from and surviving an OHCA without any additional co-morbidities. Co-morbidity might also result in a longer time than six months to recover, which might be captured in longitudinal follow-up and not in cross-sectional studies. For example, the COSCA-recommendations[2] support a recovery period of one year. Unfortunately, we lack data on co-morbidities. However, after controlling for age, sex and initial rhythm, the effect size in terms of R^2 and pseudo R^2 was small. Although our results show consistent findings across the different measures of HRQoL, the clinical relevance of these differences is therefore still unclear.

It is noteworthy that we identified HRQoL differences between OHCA and IHCA survivors in all measures except for depression measured with HADS and anxiety/depression measured with EQ-5D-5L. This finding was present in both adjusted and unadjusted analyses. Thus, it seems that problems with depression is not related to the location for the CA. These findings have not been reported before. One explanation may be that many survivors reported problems with depression but to a low extend. The low average score for both depression measured by HADS and anxiety/depression measured by EQ-5 D-5 L support this explanation. It is also important to remember that EQ-5D-5L combine anxiety and depression in the same measure while HADS have specific subscales for anxiety and depression.

The aim of this study was not to investigate the importance of age, sex and initial rhythm for the survivors HRQoL. However, the adjusted regression models showed that these covariates played an important

Table 2 – Associations between type of cardiac arrest and health-related quality of life (EQ-5D-5L) among 2141 Swedish patients surviving 6 months after a cardiac arrest during 2014–2017, based on generalized logistic regression for ordinal dependent variables (the unconstrained proportional odds model).

Outcome variables	Explanatory variables	*B* (se)	95% CI for *B*	*p*-value
Mobility	OHCA	−0.61 (0.10)	(−0.80 to −0.41)	<0.001
	Age	0.03 (0.00)	(0.03 to 0.04)	<0.001
	Female sex	0.38 (0.09)	(0.20 to 0.56)	<0.001
	Non-shockable rhythm[a]	0.54 (0.10)	(0.33 to 0.74)	<0.001
	Unknown rhythm[a]	0.40 (0.12)	(0.17 to 0.63)	0.001
	Model statistics:	LR $\chi^2(5) = 256.3$, $p < 0.001$, McFadden $R^2 = 0.05$		
Self-care	OHCA	−0.53 (0.13)	(−0.78 to −0.27)	<0.001
	Age	0.02 (0.00)	(0.01 to 0.03)	<0.001
	Female sex	0.21 (0.12)	(−0.01 to 0.43)	0.068
	Non-shockable rhythm[a]	0.66 (0.13)	(0.41 to 0.91)	<0.001
	Unknown rhythm[a]	0.41 (0.15)	(0.12 to 0.71)	0.006
	Model statistics:	LR $\chi^2(5) = 110.4$, $p < 0.001$, McFadden $R^2 = 0.04$		
Usual activities	OHCA	−0.34 (0.09)	(−0.51 to −0.16)	<0.001
	Age	0.01 (0.00)	(0.01 to −0.02)	<0.001
	Female sex	0.30 (0.09)	(0.12 to 0.48)	0.001
	Non-shockable rhythm[a]	0.32 (0.10)	(0.12 to 0.51)	0.002
	Unknown rhythm[a]	0.31 (0.11)	(0.08 to 0.53)	
	Model statistics:	LR $\chi^2(5) = 83.4$, $p < 0.001$, McFadden $R^2 = 0.02$		
Pain/discomfort	OHCA	−0.25 (0.09)	(−0.42 to −0.08)	0.004
	Age	0.00 (0.00)	(−0.01 to 0.01)	0.206
	Female sex	0.57 (0.09)	(0.39 to 0.74)	<0.001
	Non.shockable rhythm[a]	0.26 (0.10)	(0.07 to 0.46)	0.009
	Unknown rhythm[a]	0.29 (0.11)	(0.07 to 0.51)	0.009
	Model statistics:	LR $\chi^2(5) = 84.4$, $p < 0.001$, McFadden $R^2 = 0.02$		
Anxiety/depression	OHCA	−0.09 (0.09)	(−0.27 to 0.09)	0.340
	Age	−0.02 (0.00)	(−0.03 to −0.01)	<0.001
	Female sex	0.54 (0.09)	(0.37 to 0.72)	<0.001
	Non-shockable rhythm[a]	0.23 (0.10)	(0.02 to 0.43)	0.029
	Unknown rhythm[a]	0.24 (0.12)	(0.02 to 0.47)	0.035
	Model statistics:	LR $\chi^2(5) = 83.6$, $p < 0.001$, McFadden $R^2 = 0.02$		

B = regression coefficients; se = standard error; CI = confidence interval.
[a] Shockable rhythm = reference.

Table 3 – Association based on multiple linear regression between type of cardiac arrest and health-related quality of life (EQ VAS and Hospital Anxiety and Depression Scale (HADS)) among 2141 Swedish patients surviving 6 months after an cardiac arrest during 2014–2017.

Outcome variables	Explanatory variables	*B* (se)	95% CI for *B*	*p*-value
EQ VAS	OHCA	5.67 (0.98)	(3.76 to 7.60)	<0.001
	Age	−0.09 (0.03)	(−0.16 to −0.02)	0.008
	Female sex	−3.80 (0.99)	(−5.74 to −1.86)	<0.001
	Non-shockable rhythm[a]	−3.70 (1.13)	(−5.91 to −1. 49)	0.001
	Unknown rhythm[a]	−3.11 (1.25)	(−5.57 to −0.66)	0.013
	Model statistics:	$F(5, 2134) = 20.85$, $p < 0.001$, $R^2 = 0.05$		
HADS anxiety	OHCA	−0.50 (0.18)	(−0.86 to −0.14)	0.006
	Age	−0.05 (0.01)	(−0.06 to −0.04)	<0.001
	Female sex	1.00 (0.18)	(0.64 to 1.36)	<0.001
	Non-shockable rhythm[a]	0.50 (0.21)	(0.09 to 0.91)	0.016
	Unknown rhythm[a]	0.54 (0.23)	(0.09 to 1.00)	0.019
	Model statistics:	$F(5, 2134) = 20.68$, $p < 0.001$, $R^2 = 0.05$		
HADS depression	OHCA	−0.26 (0.18)	(−0.62 to 0.09)	0.145
	Age	0.00 (0.01)	(−0.01 to 0.01)	0.931
	Female sex	0.63 (0.18)	(0.27 to 0.99)	0.001
	Non-shockable rhythm[a]	0.43 (0.21)	(0.02 to 0.84)	0.039
	Unknown rhythm[a]	0.77 (0.23)	(0.31 to 1.22)	0.001
	Model statistics:	$F(5, 2134) = 6.80$, $p < 0.001$, $R^2 = 0.02$		

B = unstandardized regression coefficient; se = standard error; CI = confidence interval.
[a] Shockable rhythm = reference.

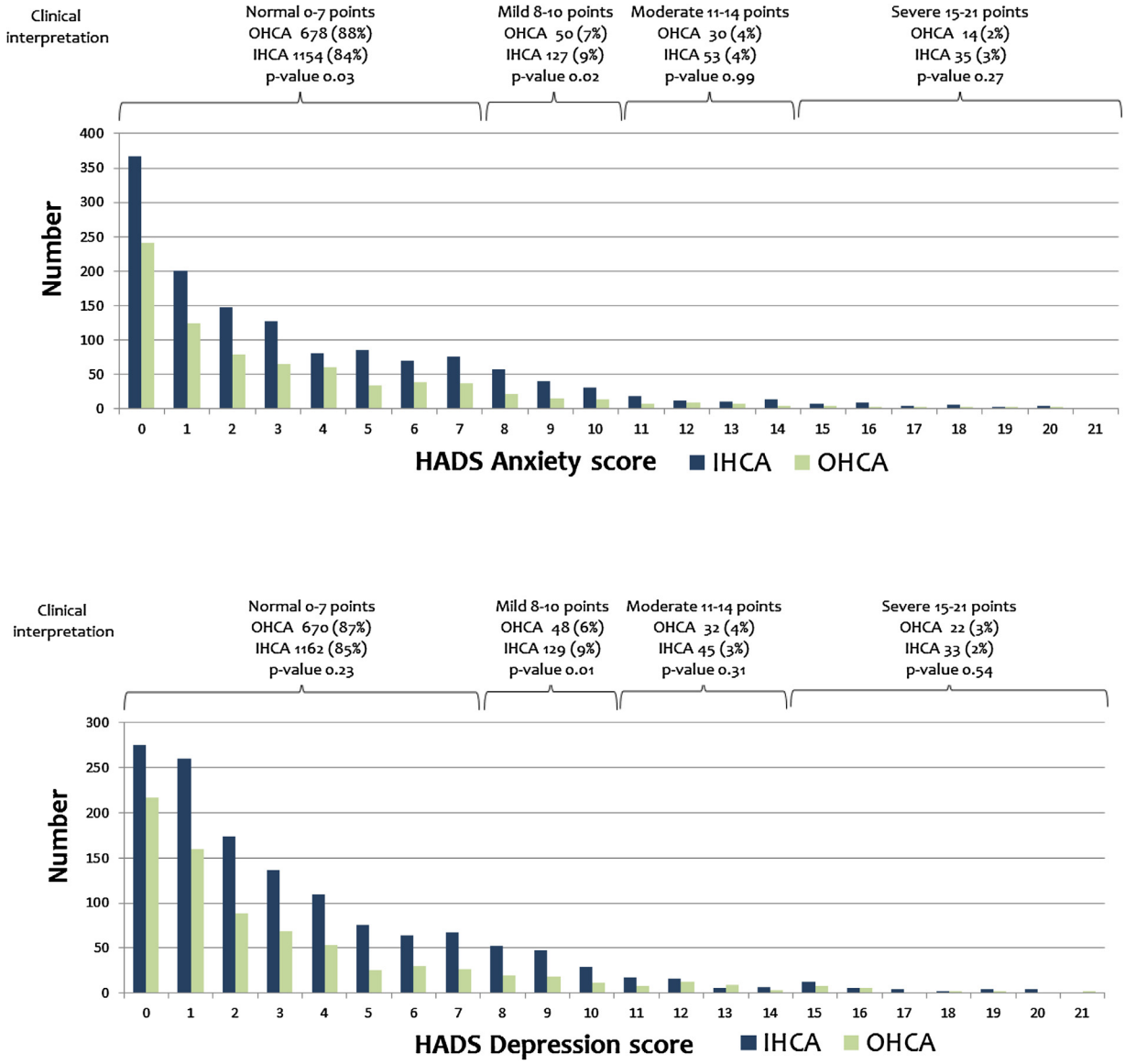

Fig. 3 – Distributions of symptoms of anxiety and depression using the Hospital Anxiety and Depression Scale among 2141 Swedish patients surviving 6 months after a cardiac arrest during 2014–2017.

role to explain the variance in HRQoL. Overall, higher age, female sex and non-shockable rhythm were associated with poorer HRQoL. Recent studies have also concluded that women report worse HRQoL after OHCA[18] and IHCA[4] compared to men. Interestingly, women more often survive an IHCA despite disadvantageous prerequisites such as higher age and more often non-shockable first rhythm compared to men.[19]

This study has some limitations that should be considered. According to the national Swedish Register of Cardiopulmonary Resuscitation, all survivors shall undergo a third registration including assessment of HRQoL. Despite this, the response rate of all reported survivors in the registry during 2014–2017 was 55% and 57% for OHCA and IHCA survivors respectively and the two major reasons to not participate were "unknown" or "other". Importantly, since cognitive function was given as the reason to not participate in 7% and 8% for OHCA and IHCA respectively, it is likely that the HRQoL would be poorer among non-participants. Despite this missing data, the current study is so far the world's largest published and it includes the majority of cardiac arrest survivors in a nationwide population-based cohort. Regarding the HRQoL assessments that were used, both EQ-5D-5L and HADS are generic instruments, i.e. not specific for cardiac arrest survivors. It is therefore difficult to draw any strong conclusions about the impact the cardiac arrest have had on the survivors HRQoL. Likewise, we do not know if the reported HRQoL is a result of the cardiac arrest or was the same as before the cardiac arrest. Until today, there exists no disease specific instruments to measure HRQoL in cardiac arrest survivors and this is therefore a limitation for all HRQoL research in this field. Finally, we lack information regarding comparable comorbidities and the duration and etiology of the cardiac arrest which might be of relevance for HRQoL. Strengths include the national population-based all-encompassing coverage and the large sample size.

Clinical implications for others might be related to our good experience from a HRQoL assessment in the national registry as inspiration and development of national guidelines for follow-up.[20] Integration of HRQoL assessment into clinical praxis in follow-up care might contribute to identify survivors with poor HRQoL and in need of health-supportive interventions.

In conclusion, HRQoL in cardiac arrest survivors is in general good, but survivors of IHCA report more health problems compared to OHCA survivors even after adjustment for age, sex and initial rhythm. Thereby, the current study supports that survivors of IHCA and survivors of OHCA differ and that research data gathered from one of these populations may not be generalizable to the other.

Conflict of interest

None declared.

Funding

T.D. was supported by the Stockholm County Council (clinical research appointment).

Acknowledgement

TD was supported by Stockholm County (clinical researcher).

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