



## **Sex Differences in Patient-Reported Outcomes in the Immediate Recovery Period After Resuscitation**

### *Findings From the Cross-sectional DenHeart Survey*

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# Sex Differences in Patient-Reported Outcomes in the Immediate Recovery Period After Resuscitation: Findings From the Cross-sectional DenHeart Survey

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**Background:** A paucity of resuscitation studies have examined sex differences in patient-reported outcomes upon hospital discharge. It remains unclear whether male and female patients differ in health outcomes in their immediate responses to trauma and treatment after resuscitation. **Objectives:** The aim of this study was to examine sex differences in patient-reported outcomes in the immediate recovery period after resuscitation. **Methods:** In a national cross-sectional survey, patient-reported outcomes were measured by 5 instruments: symptoms of anxiety and depression (Hospital Anxiety and Depression Scale), illness perception (Brief Illness Perception Questionnaire [B-IPQ]), symptom burden (Edmonton Symptom Assessment Scale [ESAS]), quality of life (Heart Quality of Life Questionnaire), and perceived health status (12-Item Short Form Survey). **Results:** Of 491 eligible survivors of cardiac arrest, 176 (80% male) participated. Compared with male, resuscitated female reported worse symptoms

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of anxiety (Hospital Anxiety and Depression Scale–Anxiety score  $\geq 8$ ) (43% vs 23%;  $P = .04$ ), emotional responses (B-IPQ) (mean [SD], 4.9 [3.12] vs 3.7 [2.99];  $P = .05$ ), identity (B-IPQ) (mean [SD], 4.3 [3.10] vs 4.0 [2.85];  $P = .04$ ), fatigue (ESAS) (mean [SD], 5.26 [2.48] vs 3.92 [2.93];  $P = .01$ ), and depressive symptoms (ESAS) (mean [SD], 2.60 [2.68] vs 1.67 [2.19];  $P = .05$ ). **Conclusions:** Between sexes, female survivors of cardiac arrest reported worse psychological distress and illness perception and higher symptom burden in the immediate recovery period after resuscitation. Attention should focus on early symptom screening at hospital discharge to identify those in need of targeted psychological support and rehabilitation.

**KEY WORDS:** health survey, patient-reported outcomes, sex differences, sudden cardiac arrest

A substantial number of survivors of sudden cardiac arrest experience short- and long-term consequences on daily life during their recovery after resuscitation.<sup>1</sup> One of the most prevalent postarrest challenges is psychopathological manifestations.<sup>2</sup> According to the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition*, psychopathology is defined as “a behavioral or psychological syndrome or pattern that occurs in an individual.”<sup>3</sup>

Although survival rates are increasing,<sup>4,5</sup> sudden cardiac arrest continues to be an important public health issue.<sup>6</sup> The annual estimated incidence of out-of-hospital cardiac arrest lies between 67 and 170 per 100 000 individuals in Europe.<sup>7</sup> Compared with female, male have a 3-fold risk of cardiac arrest across all age groups. However, female individuals who had a cardiac arrest are older, have more comorbidities, have fewer initial shockable rhythms, and receive less prehospital resuscitation efforts than male cardiac arrest individuals.<sup>8,9</sup> The reasons for the lower cardiopulmonary resuscitation attempts in female are suggested to be caused by fewer witnessed arrests, as elderly female often live alone, and by cultural barriers, for example, removing clothes from a female upper chest area.<sup>8</sup> Although controversial,<sup>10</sup> most previous resuscitation studies find that female patients experience higher mortality.<sup>11,12</sup> Moreover, octogenarians have been found to have lower odds of being successfully resuscitated.<sup>13</sup> Growing research demonstrate that male and female differ in susceptibility to common diseases and response to treatment. Literature suggests that to understand the complexity of and nuance in health outcomes, knowledge from male-female health differences has to be considered to improve human health and avoid detrimental health outcomes and high health costs.<sup>14</sup>

Psychopathology seems to increase the risk of cardiovascular death in patients with established heart diseases.<sup>15</sup> Moreover, psychopathology negatively affects the level of daily functioning and health-related quality of life (HRQoL) and prevents survivors of cardiac arrest from returning to previous social roles.<sup>2,16–18</sup> This is particularly observed among patients who were comatose during hospital management.<sup>19,20</sup> Female survivors report significantly more prolonged anxiety,<sup>21</sup> depressive mood,<sup>22</sup> and posttraumatic stress disorder than male survivors do.<sup>23,24</sup> In addition, female report poorer functional recovery and HRQoL after out-of-hospital

cardiac arrest.<sup>25</sup> Still, Bosson et al<sup>24</sup> have reported that female receive less postarrest interventions. A recent study found that the presence of self-reported acute traumatic stress upon hospital discharge is strongly associated with posttraumatic stress disorder up to 1 year after survival. In addition, these trauma reactions were more prevalent in female than male survivors.<sup>26</sup> Evidence to inform how and when to screen for postarrest psychological distress and symptom burden at hospital discharge is scarce.<sup>7</sup>

A recent scientific statement on the sudden cardiac arrest survivorship suggests including more somatic symptoms on affective domains at hospital discharge.<sup>27</sup> Moreover, it remains unclear whether male and female survivors differ in health outcomes in their immediate responses to trauma and treatment after resuscitation.<sup>28</sup> To bridge and optimize the gap between clinician-based understanding and patient experience, patient-reported outcomes (PROs) are beneficial when collecting important information about the subjective burden of postarrest symptoms and the impact of resuscitation and concomitant treatment.<sup>29</sup> Therefore, in an era of patient-centered care, the aim of this study was to examine sex differences in illness perception, symptom burden, anxiety, depression, HRQoL, and perceived health status in the immediate recovery period after resuscitation.

## Methods

### Study Design, Setting, and Patient Sample

Data were derived from the national cross-sectional DenHeart survey investigating PROs regarding health among cardiac patients at hospital discharge. The design of the original DenHeart study has been described previously in a detailed study protocol.<sup>30</sup> All included patients in the DenHeart study were discharged from 1 of 5 heart centers in Denmark in the period April 15, 2013, to April 15, 2014. Before leaving the hospital, all eligible patients were recruited and asked to complete a self-administrated questionnaire. If not possible, the patients were asked to complete the questionnaire within 3 days after discharge and return it by mail within 4 weeks postdischarge. Exclusion criteria were being younger than 18 years, having no Danish civil registration number, and not understanding Danish.

The study population was restricted to include survivors of cardiac arrest discharged with a presumed favorable neurocognitive outcome defined as Cerebral Performance Category (CPC) scores 1 or 2 on the Glasgow-Pittsburgh CPC and thereby expected to be able to report PROs.<sup>31</sup> Eligible patients were identified by diagnosis (International Classification of Diseases-10; A and B diagnosis) and a cardiac arrest diagnosis (I46). Associated codes were included: cardiac arrest without specification (I46.9), cardiac arrest with successful resuscitation (I46.0), and ventricular fibrillation (I49.0B). Study reporting follows the STROBE Statement for cross-sectional studies ([www.strobe-statement.org](http://www.strobe-statement.org)).

## Data Sources and Variables

### Register Data

Information on sociodemographic variables were obtained via the following national registers: the Danish Civil Registration System,<sup>32</sup> the Danish National Patient Register,<sup>33</sup> and the Danish Education Registers.<sup>34</sup> Demographic characteristics (eg, sex, age, and the highest level of highest completed education) were collected from the Danish Civil Registration System and the Danish Education Registers. Level of comorbidity was collected from the Danish National Patient Register<sup>33</sup> and was based on the Tu Comorbidity Index score.<sup>35</sup> This score included the following diseases: congestive heart failure, cardiogenic shock, arrhythmia, pulmonary edema, malignancy, diabetes, cerebrovascular disease, acute/chronic renal failure, and chronic obstructive pulmonary disease, and was calculated 10 years back.<sup>35</sup>

### Clinical Variables

Clinical data were obtained from a database in The Danish Clinical Quality Program–National Clinical Registry: the Danish Intensive Care Database.<sup>36</sup> Quality indicators obtained from the Danish Intensive Care Database were length of intensive care unit (ICU) admission and the following treatment variables: mechanically ventilated, length of time on ventilator, in a state of septic shock, and organ supportive treatments as use of inotropic agents.<sup>36</sup>

### Patient-Reported Outcomes

The PROs in this study were assessed using the following 5 questionnaires.

#### Hospital Anxiety and Depression Scale

Symptoms of anxiety and depression were assessed with the Hospital Anxiety and Depression Scale (HADS).<sup>37</sup> The HADS consists of two 7-item subscales measuring symptoms of anxiety and symptoms of depression for the past week, respectively. This standardized questionnaire is designed to assess mood disorders in non-psychiatric populations. The highest possible score for each subscale is 21, with higher scores representing more psychological distress. The scale is used with a cut-off score of 8 or higher,

indicating the presence of anxiety and/or depression. The validity and reliability of the HADS are good, with a mean Cronbach's  $\alpha$  of 0.83 and 0.82 for the HADS-A and HADS-D, respectively.<sup>38</sup>

#### Brief Illness Perception Questionnaire

The Brief Illness Perception Questionnaire (B-IPQ)<sup>38</sup> was used to assess current cognitive and emotional representations of illness on the basis of 8 items. Five items assess cognitive illness representations: consequences (item 1), timeline (item 2), personal control (item 3), treatment control (item 4), and identity (item 5). Two items assess emotional illness representations: illness concern (item 6) and emotional response (item 8). One item assesses illness comprehensibility (understanding) (item 7). All of the items are rated using a 0 to 10 rating scale. Higher scores on items 1, 2, 5, 6, and 8 reflect a more threatening view of illness. In contrast, lower scores on items 3, 4, and 7 reflect a higher perceived threat associated with the condition. The B-IPQ has good reliability and has shown good predictive validity among patients recovering from myocardial infarction.<sup>39</sup>

#### Edmonton Symptom Assessment Scale

The Edmonton Symptom Assessment Scale (ESAS)<sup>40</sup> was administered to assess current symptom burden. It is a 10-item questionnaire that allows patients to rate symptoms of pain, tiredness/fatigue (decreased energy level), nausea, drowsiness (sleepiness), appetite, shortness of breath, depression (blue or sad), anxiety (nervousness or restlessness), dizziness, and sensation of well-being (overall comfort, both physical and otherwise) on a visual numeric scale. Higher scores indicate the presence and intensity of the symptoms. Although not validated in cardiac populations, ESAS is widely used for symptom assessment in clinical and research settings and is a validated instrument used in different populations of cancer patients.<sup>40</sup>

#### Heart Quality of Life Questionnaire

The validated ischemic heart disease questionnaire Heart Quality of Life Questionnaire (HeartQoL)<sup>41,42</sup> was administered to assess disease-specific HRQoL. The 14 items in the HeartQoL scale cluster as a bidimensional questionnaire with a 10-item HeartQoL physical subscale and a 4-item HeartQoL emotional subscale providing a global assessment and evaluation of how much a patient is bothered with their heart disease within the previous 4 weeks. The answer options range from 0 to 3 (poor to better HRQoL), with higher scores indicating better HRQoL status. The Danish HeartQoL questionnaire has demonstrated satisfactory psychometric attributes of validity and reliability in recipients of implantable cardioverter defibrillator.<sup>43</sup>

#### 12-Item Short Form Survey

The 12-Item Short Form Survey (SF-12) is a generic 12-item questionnaire measure of overall health divided

into 2 components, the physical component summary score and the mental component summary score.<sup>44</sup> The component scores are calculated to summarize physical and mental functioning, respectively. The patients estimate their health during the past 4 weeks. Cronbach’s  $\alpha$  values of 0.87 and 0.84 for PCS-12 and MCS-12, respectively, have been reported in a population of coronary heart disease patients. Moreover, SF-12 is found as a useful measure of HRQoL in survivors of out-of-hospital cardiac arrest<sup>45</sup> and is claimed with acceptable evidence to discriminate between male and female.<sup>46</sup>

Ancillary Questions

Information on health behaviors, such as body weight and height, smoking habits, and use of alcohol, were only obtained via the questionnaire. Body weight and height were used to assess body mass index. Alcohol intake was assessed by a beverage-specific question asking for the number of standard drinks for each day in a typical week. One standard drink contains 12 g of pure alcohol. Moreover, 1 ancillary question on loneliness was included in these analyses: “Does it ever happen that you are alone, even though you would prefer to be with other people?”

Statistical Methods

Descriptive statistics are reported as mean values and standard deviation (SD), numbers and percentages, or median and interquartile range as indicated. Comparisons between male and female in PROs (HADS, B-IPQ, ESAS, HeartQoL, and SF-12) and loneliness upon hospital discharge were carried out using Students *t* tests, Pearson  $\chi^2$  test, and Fisher Exact test where appropriate. Linear and logistic regression models were used to calculate age-adjusted *P* values for continuous and binary outcomes, respectively. All statistical analyses were conducted using STATA 15.1 (StataCorp, 2017; Stata Statistical Software: Release 15, StataCorp LLC, College Station, Texas). An  $\alpha$  level of 0.05 was considered the threshold for statistical significance.

Ethics

The DenHeart study was approved by the institutional boards of the participating heart centers and complies with the principles outlined in the Declaration of Helsinki. The Danish Protection Agency approved the handling of data (reg. 2007-58-0015/30-0937) and is registered at ClinicalTrials.gov (NCT01926145). All patients

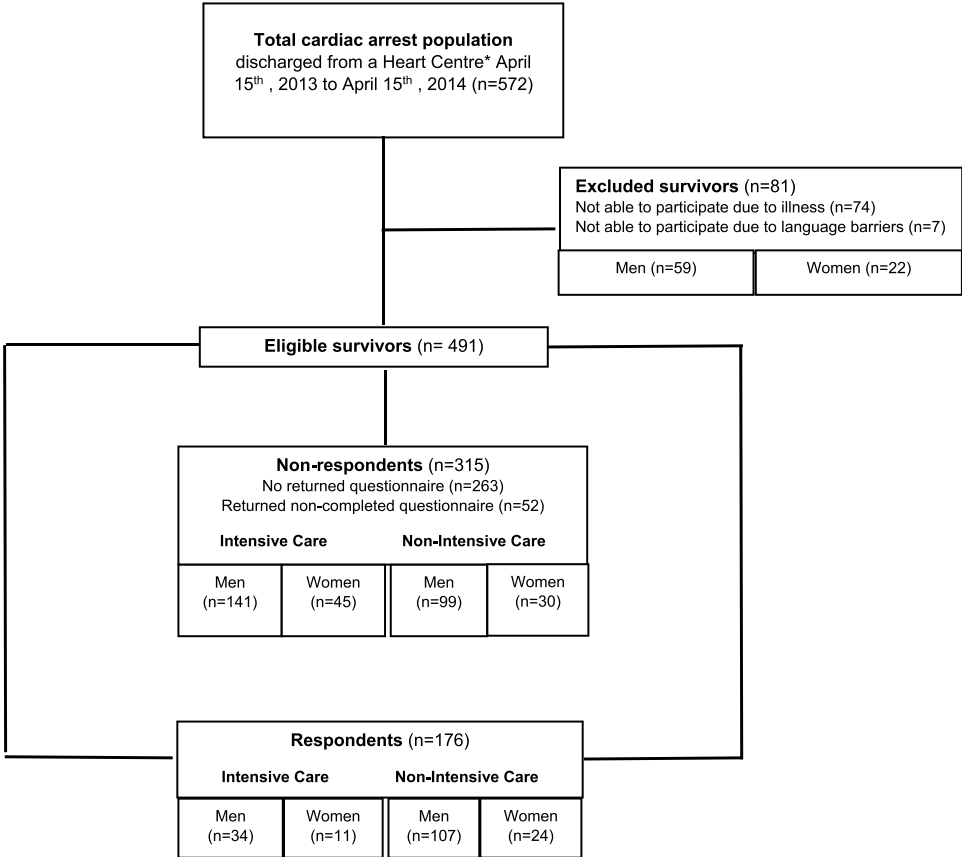


FIGURE. Patient flowchart.



provided informed consent based on both oral and written study information.

## Results

### Patient Characteristics in Relation to Sex

The population comprised a total of 491 eligible survivors of cardiac arrest with a favorable outcome (CPC score  $\leq 2$ ) treated at and discharged from a heart center (Figure). In all, 381 (78%) were male and 110 were female. Because of organ failure, 231 patients (175 male [76%] and 56 female) were admitted to and treated at the ICU. During the ICU admission, more than 90% were mechanically ventilated for a range between 1 and 9 days, and 89% were treated with inotropic agents. Of eligible survivors, approximately 60% (for both male and female) were treated in the ICU. Table 1 summarizes sociodemographic and clinical variables for the total population (respondents vs nonrespondents) stratified by sex.

As shown in the flowchart (Figure), 176 respondents completed the questionnaire. Most of the surveys were

completed just upon hospital discharge. Most respondents were male (80%). The overall response rate was 36%. The male ICU respondents comprised 19% and the female ICU respondents comprised 6%, whereas the response rate among those treated at non-ICUs was 61% for male and 14% for female. Compared with the female respondents, male respondents were significantly older (mean, 59.5 vs 52.7 years;  $P = .01$ ), more likely to be married (73% vs 49%;  $P = .02$ ), and more often known to have ischemic heart disease (42% vs 9%;  $P < .001$ ), and approximately one-fifth had previously been treated with percutaneous coronary intervention, against less than 5%.

As shown in Tables 2 and 3, the female survivors were more likely to report negative consequences and worse PROs upon hospital discharge than the male survivors.

### Psychological Distress and Illness Perception at Hospital Discharge—Stratified by Sex

Table 2 shows that a significantly higher proportion of the female experienced symptoms of anxiety, defined as

**TABLE 1** Sex Stratified Sociodemographic and Clinical Characteristics of Cardiac Arrest Nonrespondents Versus Respondents

	Eligible Cardiac Arrest Population						
	Male			Female			
	Nonrespondents (n = 240)	Respondents (n = 141)	$P_a$	Nonrespondents (n = 75)	Respondents (n = 35)	$P_a$	$P_b$
Age, mean (range), y	64.3 (18–94)	59.5 (20–88)	.17	59.8 (18–91)	52.7 (21–77)	.89	.01
Married, n (%)	143 (59.6)	104 (73.2)	.02	36 (48.0)	17 (48.6)	.26	.02
Hospital length of stay, mean (range), days	7 (1–161)	6 (1–32)	.70	7 (1–33)	8 (1–27)	.11	.12
Highest completed education, n (%)							
Basic school or no information	89 (37.1)	33 (23.2)	.08	33 (44.0)	13 (37.2)	.29	.15
Upper secondary or vocational school	112 (46.7)	75 (52.8)		27 (36.0)	14 (40.0)		
Higher education	39 (16.3)	34 (23.9)		15 (20.0)	8 (22.9)		
Intensive care unit treatment, n (%)	141 (58.8)	34 (23.9)	<.001	45 (60.0)	11 (31.4)	.01	.36
Comorbidities 10 years back, n (%)							
Known ischemic heart disease	89 (37.1)	60 (42.3)	.32	11 (14.7)	<5	.54	<.001
Arterial hypertension	71 (29.6)	35 (25.4)	.37	25 (33.3)	5 (14.3)	.04	.17
Ventricular arrhythmia	40 (16.7)	51 (35.9)	<.001	12 (16.0)	13 (37.1)	.01	.89
Heart failure	68 (28.3)	37 (26.1)	.63	13 (17.3)	10 (28.6)	.18	.76
Previous PCI	38 (15.3)	30 (21.1)	.19	<5	<5	.56	.01
Previous CABG	7 (2.9)	19 (13.4)	<.001	<5	<5	.95	.08
COPD	17 (7.1)	7 (4.9)	.40	17 (22.7)	<5	.20	.23
Tu-Comorbidity score, n (%)							
0	98 (40.8)	55 (38.7)	.37	36 (48.0)	11 (31.4)	.05	.61
1	58 (24.2)	45 (31.7)		15 (20.0)	11 (31.4)		
$\geq 2$	84 (35.1)	44 (29.6)		24 (32.0)	13 (37.2)		
Health behavior, n (%)							
BMI $\geq 25$	N/A	89 (66.4)		N/A	20 (64.5)		.84
BMI $\geq 30$	N/A	33 (24.6)		N/A	8 (25.8)		.89
Smoking 15 cigarettes or more per day	N/A	17 (12.0)		N/A	<5		.77
High alcohol intake <sup>a</sup>	N/A	8 (7.0)		N/A	<5		.71

$P_a$ : test of statistical significance (between nonrespondents and respondents).

$P_b$ : test of statistical significance (between male and female respondents).

Abbreviations: PCI, percutaneous coronary intervention; CABG, coronary artery bypass grafting; COPD, chronic obstructive pulmonary disease; BMI, body mass index.

<sup>a</sup>The Danish Health Authority defines the high risk limit for alcohol consumption as a weekly intake of more than 21 standard drinks for male and more than 14 standard drinks for female.

**TABLE 2** Patient-Reported Outcomes Among Male and Female Respondents at Hospital Discharge

	All Respondents (n = 176)	Male Respondents (n = 141)	Female Respondents (n = 35)	P <sup>a</sup>
HADS				
HADS-A, mean (SD)	5.4 (4.17)	5.1 (4.16)	6.5 (4.10)	.05
HADS-A ≥8, n (%)	46 (28)	31 (23)	15 (43)	.04
HADS-D, mean (SD)	3.6 (3.32)	3.6 (3.41)	3.5 (2.92)	.95
HADS-D ≥8, n (%)	26 (16)	22 (16)	<5	.79
B-IPQ, mean (SD)				
Cognitive and emotional representations of illness				
Consequences	4.9 (2.79)	4.8 (2.85)	5.2 (2.55)	.80
Timeline	5.6 (3.42)	5.4 (3.43)	6.2 (3.39)	.40
Personal control	6.2 (3.03)	6.0 (3.12)	6.8 (2.58)	.21
Treatment control	8.6 (1.91)	8.7 (1.85)	8.4 (2.15)	.68
Identity	4.1 (2.89)	4.0 (2.85)	4.3 (3.10)	.02
Illness concern	4.7 (3.20)	4.5 (3.11)	5.5 (3.49)	.21
Illness comprehensibility (understanding)	7.8 (2.44)	7.9 (2.31)	7.1 (2.84)	.16
Emotional response	3.9 (3.05)	3.7 (2.99)	4.9 (3.12)	.05
ESAS, mean (SD)				
Symptom distress score	20.8 (16.91)	19.8 (16.96)	24.9 (16.28)	.24
SF-12, mean (SD)				
Physical component summary score (PCS)	42.8 (10.97)	43.4 (10.46)	40.7 (12.91)	.17
Mental component summary score (MCS)	49.8 (11.31)	50.2 (11.17)	48.4 (11.98)	.42
HeartQoL, mean (SD)				
HeartQoL global	1.9 (0.83)	2.0 (0.83)	1.8 (0.82)	.19
HeartQoL physical	1.8 (0.93)	1.9 (0.92)	1.7 (0.94)	.16
HeartQoL, emotional	2.3 (0.86)	2.3 (0.83)	1.9 (0.94)	.17
Loneliness, n (%)				
Feeling alone				
Sometimes or often	47 (27)	34 (25)	13 (38)	.64

Abbreviations: HADS-A, Hospital Anxiety and Depression Scale for anxiety; HADS-D, Hospital Anxiety and Depression Scale for depression; B-IPQ: Brief Illness Perception Questionnaire; ESAS, ESAS, Edmonton Symptom Assessment System; SF-12, 12-Item Short Form Survey; HeartQoL, Heart Quality of Life Questionnaire.

<sup>a</sup>Test of statistical significance (between male and female respondents adjusted for age).

HADS-A score of 8 or higher, compared with the male (43% vs 23%;  $P = .04$ ). Moreover, a tendency toward a significant difference between sexes was found on the B-IPQ subscale *emotional responses*: 4.9 (SD, 3.12) versus 3.7 (SD, 2.99) ( $P = .05$ ), with the female survivors being more likely to report negative emotional reactions such as fear, anger, and distress. On the subscale *identity*, the female also reported the number of symptoms

experienced as part of surviving cardiac arrest more extensive and challenging when compared with the male: 4.3 (SD, 3.10) versus 4.0 (SD, 2.85) ( $P = .02$ ).

### Symptom Burden at Hospital Discharge—Stratified by Sex

As found in Table 3, statistically significant sex disparities were found for symptom burden measured by the

**TABLE 3** Symptom Burden at Hospital Discharge Among Male and Female Respondents

	All Respondents (n = 176)	Male Respondents (n = 141)	Female Respondents (n = 35)	P <sup>a</sup>
ESAS	20.8 (16.91) 17.0 [7–30]	19.8 (16.96) 15.0 [6–28]	24.9 (16.28) 22.0 [12–38.5]	.24
Pain	2.93 (2.77) 3.0 [1–5]	2.79 (2.78) 2.0 [0.5–5]	3.52 (2.69) 3.0 [1–6]	.06
Tiredness/fatigue (decreased energy level)	4.19 (2.89) 3.0 [2–7]	3.92 (2.93) 3.0 [1–7]	5.26 (2.48) 6.0 [3–7]	.01
Nausea	0.95 (2.00) 0.0 [0–1]	0.89 (1.91) 0.0 [0–1]	1.21 (2.20) 0.0 [0–1]	.70
Drowsiness (sleepiness)	2.77 (2.66) 2.0 [0–5]	2.67 (2.67) 2.0 [0–4]	3.17 (2.61) 3.0 [1–5]	.44
Appetite	2.02 (2.58) 0.0 [0–4]	1.94 (2.58) 0.0 [0–4]	2.34 (2.59) 1.0 [0–5]	.67
Shortness of breath	2.48 (2.83) 2.0 [0–4]	2.52 (2.97) 1.0 [0–5]	2.29 (2.18) 2.0 [0–4]	.04
Depressed (blue or sad)	1.86 (2.32) 1.0 [0–3]	1.67 (2.19) 1.0 [0–3]	2.60 (2.68) 2.0 [0–4]	.05
Anxious (nervousness or restlessness)	1.80 (2.59) 0.0 [0–3]	1.66 (2.52) 0.0 [0–3]	2.34 (2.83) 2.0 [0–3]	.29
Dizziness	1.74 (2.24) 1.0 [0–3]	1.67 (2.17) 1.0 [0–3]	2.03 (2.50) 1.0 [0–4]	.63
Sensation of well-being (overall comfort, both physical and otherwise)	2.17 (2.39) 1.0 [0–4]	2.04 (2.40) 1.0 [0–3]	2.66 (2.31) 2.0 [0–5]	.28

Data are mean (SD) and median [interquartile range].

Abbreviation: ESAS, Edmonton Symptom Assessment System.

<sup>a</sup>Test of statistical significance (between male and female respondents adjusted for age).

ESAS mean scores on the subscales of *tiredness/fatigue* (3.92 [SD, 2.93] vs 5.26 [SD, 2.48];  $P = .01$ ) and *depressed* (1.67 [SD, 2.19] vs 2.60 [SD, 2.68];  $P = .05$ ), with female being considerably more burdened by those symptoms than male after resuscitation.

No significant sex differences were detected in either HRQoL, perceived health, or loneliness.

## Discussion

### Key Results

The current study found that male and female differ in their immediate responses to trauma and treatment after resuscitation. The female survivors of cardiac arrest tended to report worse psychological distress and illness perception and higher symptom burden at hospital discharge. In a recent scientific statement on the cardiac arrest survivorship, Sawyer et al<sup>27</sup> emphasize and ask: “which patients develop psychological disorders after resuscitation?” Multiple factors may affect the postarrest psychological recovery, and various explanations may exist for this.<sup>47</sup> Consistent with previous studies,<sup>48–50</sup> we found postarrest fatigue as the most prevalent patient-reported symptom and challenging problem for both resuscitated male and female upon hospital discharge. Notably, protracted fatigue has previously been described as present in approximately 70% of the survivors at 6 months and remains present in half of the survivors 1 year after the cardiac arrest.<sup>48,51</sup> A European study on survivors of out-of-hospital cardiac arrest found fatigue to be one of the most predictive factors for a lower participation in society and activities of everyday life.<sup>52</sup> In addition, fatigue seems strongly associated with both anxiety and depression.<sup>7</sup>

Moreover, as mentioned, a substantially higher proportion of female survivors experienced symptoms of anxiety than the male survivors. This may indicate that female survivors perceive a traumatic event such as cardiac arrest as a more stressful event compared with male survivors, with complaints at hospital discharge that include more affective components. However, it is worth noticing that epidemiological findings point out that male and female manifest disease in fundamentally different ways. Female in general are more likely to report worse psychological distress, have higher disability levels at all ages, and show more signs of psychopathology after a traumatic and stressful event compared with male.<sup>23,53</sup> Literature has suggested that sex-related factors such as hormonal regulation and gender-related factors such as lifestyle and stress perception are likely to influence disease perception.<sup>54</sup> Although it is clear that being resuscitated can have a considerable impact on health outcomes in the immediate recovery period upon hospital discharge, especially in female survivors, this study offers a basis for planning and developing future larger-scale sex-specific studies to examine the predictive value

of discharge assessment of cardiac arrest survivor's post-arrest distress and symptom burden on longer-term psychopathology.

### Methodological Considerations and Limitations

This study included survivors of cardiac arrest from a large national cross-sectional survey. However, the study may be biased by participation bias. Compared with the non-intensive care survivors, the rather low ICU response rate among both sexes was as expected. Survivors of cardiac arrest in need of critical care often face several challenges after ICU treatment, which affect all body systems. This vulnerable group is therefore most likely not able to participate compared with the non-intensive care survivors.

Cognitive impairment after ICU treatment is a substantial problem.<sup>20</sup> A possible limitation of this study is that a cognitive screening to detect mild to moderate neurocognitive impairment at hospital discharge was not performed. In future studies, it is highly essential that a cognitive assessment is performed besides using clinician-reported measures such as the CPC<sup>55</sup> because, first, it is evident that emotional changes and development of psychopathology are common after anoxic brain damage, and second, the 5-point CPC scale has been criticized for being too crude and insensitive to detect cognitive impairment after resuscitation.<sup>27</sup>

We did not reach significant differences in several health outcomes upon hospital discharge between resuscitated male and female. The nonsignificant differences between sexes may also very well be explained by an underrepresentation of female survivors. However, this does not mean that the patient-reported measures used in this study do not have clinical importance. In particular, it is well known that patients experience more symptoms than they state.<sup>56</sup>

### Implications for Practice

As the current healthcare system does still not meet the needs of many resuscitated male and female,<sup>1</sup> it is worth considering if a short psychological screening instrument with integrated selected somatic symptoms used upon hospital discharge could help capture experiences of vulnerability that give rise to severe suffering and long-term emotional responses to trauma and treatment after resuscitation.<sup>57</sup> Most important, it seems critical to recognize early signs of fatigue and anxiety that often go unrecognized. However, it is worth noticing that emotional responses tend to be most severe in the first postarrest weeks.<sup>7</sup> To be alert to longer-term psychological challenges, repeated testing is warranted. Overall, a more insightful understanding of the sex-based imbalance in psychological burden on developing psychopathological manifestations using PROs is an important step toward more comprehensive assessment and person-centered care after resuscitation. In this endeavor, population-specific and robustly validated PROs are warranted.



### What's New and Important

- More female than male experience difficulties in their psychological adjustment after resuscitation.
- Healthcare professionals should be aware of possible sex imbalance not only in disease trajectories after cardiac arrest but also in postarrest symptom perception at hospital discharge.
- Evaluating whether sex-stratified screening, follow-up, and rehabilitation can improve outcome should be in the focus of future cardiac arrest studies.

### Conclusion

In conclusion, female survivors of cardiac arrest were more likely to report worse psychological distress and illness perception and symptom burden in their immediate responses to trauma and treatment after resuscitation than male survivors of cardiac arrest. Consistent with sex differences in general, our results indicate that more female than male experience difficulties in psychological adjustment after resuscitation. This knowledge is useful and has important clinical implications for both nurses and survivors. By understanding the cardiac arrest survivor's perspective, nurses are better able to educate the patients on what to expect when going home. Moreover, survivors of cardiac arrest are aware of the early symptoms of distress and symptom burden, that it is normal for female survivors in particular to experience an increase in anxiety and fatigue at discharge from hospital. Overall, this may improve the current discharge practices, support the postarrest aftercare and rehabilitation, and ultimately help survivors of cardiac arrest to manage the transition to everyday life and potentially prevent long-term psychopathology.

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