Gender Disparities in One-Year Survival Following Out-of-Hospital Cardiac Arrest

Emad Awad PhD[1,2], Jim Christenson MD[2,3], Christopher B. Fordyce MD, MHSc[2,4], Brian Grunau MD, MHSc[2,3], Jennie Helmer ACP[2,5], Karin Humphries PhD[2,6]

1. Department of Emergency Medicine, Faculty of Medicine, University of Utah, Utah, USA.
2. BC RESURECT: BC Resuscitation Research Collaborative, University of British Columbia, BC, Canada
3. Department of Emergency Medicine, Faculty of Medicine, The University of British Columbia, BC, Canada
4. Division of Cardiology, Faculty of Medicine, University of British Columbia, BC, Canada
5. Department of Research, British Columbia Emergency Health Services, BC, Canada
6. Department of Medicine, University of British Columbia, BC, Canada

Abstract

Background
Previous studies on gender disparities in out-of-hospital cardiac arrest (OHCA) resuscitation and outcome extensively exploring variations in prehospital interventions and short-term survival. Studies investigating gender differences in in-hospital interventions and long-term survival (one-year) are limited.

Objective
We investigated gender disparities in one-year survival within a cohort of patients who underwent out-of-hospital cardiac arrest (OHCA), received prehospital resuscitation, in-hospital intervention, and survived until hospital discharge. Subsequently, we followed up with them for one year.

Method
We performed a retrospective analysis of linked data from clinical databases in British Columbia, Canada (2011–2017). We calculated the one-year survival rate for the entire cohort and stratified it by gender. We used Cox proportional hazards analysis to assess the association between gender and one-year mortality. For each subject, the observation period commenced on the date of hospital discharge and extended up to one year, until death, or until censoring. The primary endpoint was all-cause mortality. Multiple Cox models were built using forward variable selection technique. The final model adjusted for covariates that exhibited significant variation by gender and/or had a statistically significant effect on the outcome.

Result
Females presented with a significantly lower proportion of OHCA incidents in public places (25.7% vs. 44.0%, $p < 0.001$), a reduced incidence of shockable rhythms (57.7% vs. 77.4%, $p < 0.001$), and fewer hospital-based coronary interventions. The one-year survival rates for females and males were 90.5% and 92.4%, respectively ($p = 0.31$). Adjusted Cox hazard analysis revealed no significant difference in one-year survival between males and females (hazard ratio for males vs. females = 1.14, 95% CI 0.72–1.81, $p = 0.31$).

Conclusion
Females had unfavorable prehospital OHCA characteristics and undergo fewer hospital-based coronary interventions. Despite the unfavorable characteristics and in-hospital interventions observed in females, we found no significant sex difference in one-year survival. The reasons for this observation remain unclear. Further studies are required to elucidate the underlying factors.

Table 1. Variations in baseline characteristics, comorbidities, and interventions, and survival by gender

Variables	Total N=1278	Males n=994	Females n=284	*P*-value
Prehospital characteristics				
Age per year (mean ± SD)	66.0 ± 16.7	61.0 ± 14.9	66.0 ± 16.7	0.22
EMS arrival time median	8.1 (6.5-11.5)	8.19 (6.4-11.0)	9.5 (7.0-13.2)	<0.001
Unwitnessed	233 (18.2%)	173 (17.4%)	60 (21.1%)	
Bystander-witnessed	249 (19.5%)	171 (17.2%)	78 (27.5%)	<0.001
EMS-witnessed	796 (62.3%)	650 (65.4%)	146 (51.4%)	
Public location	510 (40.0%)	437 (44.0%)	73 (25.7%)	<0.001
No bystander CPR	246 (19.2%)	177 (17.8%)	69 (24.3%)	
Bystander CPR	237 (18.5%)	167 (16.8%)	70 (24.6%)	<0.001
EMS CPR	795 (62.3%)	650 (65.4%)	145 (51.1%)	
Shockable rhythm	933 (73.0%)	769 (77.4%)	164 (57.7%)	<0.001
Epinephrine administration	497 (38.9%)	405 (40.7%)	92 (32.4%)	0.01
Admission diagnosis				
Non-MI	818 (64.0%)	596 (60.0%)	222 (78.2)	
STEMI	390 (30.5%)	338 (34.0%)	52 (18.3%)	<0.001
NSTEMI	70 (5.5%)	60 (6.0%)	10 (3.5%)	
Circulatory failure	146 (11.4%)	117 (11.8%)	29 (10.2%)	0.47
Comorbid conditions				
DM	322 (25.2%)	251 (25.3%)	71 (25.0%)	0.93
HTN	677 (53.0%)	538 (54.1%)	139 (48.9%)	0.12
CAD	647 (50.6%)	563 (56.6%)	84 (29.6%)	<0.001
Heart failure	183 (14.3%)	143 (14.4%)	40 (14.1%)	0.89
Chronic renal disease	254 (19.9%)	207 (20.8%)	47 (16.5%)	0.11
In-hospital interventions				
Diagnostic angiography	886 (69.3%)	736 (74.0%)	150 (52.8%)	<0.001
No intervention	683 (53.4%)	478 (48.1%)	205 (72.2%)	
PCI	468 (36.6%)	394 (39.6%)	74 (26.1%)	<0.001
CABG	127 (10.0%)	122 (12.3%)	05 (1.8%)	
Pacemaker or ICD implant	407 (31.9%)	324 (32.6%)	83 (29.2%)	0.56
Outcome of interest				
Survival to one year	103 (8.1%)	918 (92.4%)	257 (90.5%)	0.30

DM: Diabetes mellitus, HTN: hypertension, CABG: coronary artery bypass graft surgery, EMS: emergency medical service, ICD: implantable cardioverter defibrillator, MI: myocardial infarction. NSTEMI: non-ST-segment elevation MI, PCI: percutaneous coronary intervention. STEMI: ST-segment elevation MI.

Table2: Cox regression model: Association between gender and one-year mortality.

Model	HR (M vs F)	(95% CI)	*P*-value
Model 1 (crude)	0.80	0.51 – 1.24	0.31
Model 2 (adjusted)	1.14	0.72 – 1.81	0.57

Model 2 adjusted for age, witnessed status, arrest location, initial rhythm, diagnoses (STEMI and NSTEMI), comorbidities (CAD, CHF, renal disease), and in-hospital interventions (PCI, CABG, ICD implant).