



Clinical paper

Effect of gender on outcome of out of hospital cardiac arrest in the Resuscitation Outcomes Consortium



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ABSTRACT

Introduction: This study examined the relationship between gender and outcomes of non-traumatic out-of-hospital cardiac arrest (OHCA).

Methods: All eligible, consecutive, non-traumatic Emergency Medical Services (EMS) treated OHCA patients in the Resuscitation Outcomes Consortium between December 2005 and May 2007. Patient age was analyzed as a continuous variable and stratified in two age cohorts: 15–45 and >55 years of age (yoa). Unadjusted and adjusted (based on Utstein characteristics) chi square tests and logistic regression models were employed to examine the relationship between gender, age, and survival outcomes.

Results: This study enrolled 14,690 patients: of which 36.4% were women with a mean age of 68.3 and 63.6% of them men with a mean age of 64.2. Women survived to hospital discharge less often than men (6.4% vs. 9.1%, $p < 0.001$); the unadjusted OR was 0.69, 95%CI: 0.60, 0.77 whereas when adjusted for all Utstein predictors the difference was not significant (OR: 1.16, 95%CI: 0.98, 1.36, $p = 0.07$). The adjusted survival rate for younger women (15–45 yoa) was 11.1% vs. 9.8% for younger men (OR: 1.66, 95%CI: 1.04, 2.64, $p = 0.03$) but no difference in discharge rates was observed in the >55 cohort (OR: 0.94, 95%CI: 0.78, 1.15, $p = 0.57$).

Conclusions: Women who suffer OHCA have lower rates of survival and have unfavourable Utstein predictors. When survival is adjusted for these predictors survival is similar between men and women except in younger women suggesting that age modifies the association of gender and survival from OHCA; a result that supports a protective hormonal effect among premenopausal women.

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Background

The median incidence of cardiac arrest treated by Emergency Medical Services (EMS), across the sites participating in the Resuscitation Outcomes Consortium (ROC) is 52 per 100,000 population.¹ Survival-to-hospital discharge rates after out-of-hospital cardiac

arrest (OHCA) vary. In 2008, the survival-to-discharge rates across the ROC sites varied from 3.0% to 16.3%.¹

Certain medical conditions/diseases have gender¹-based predominance due to specific hormonal regulation.^{2–10} Furthermore gender disparities in access to care have been observed previously at many different levels of care, including primary, acute,

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¹ As per the WHO definition, "Gender" refers to the socially constructed roles, behaviors, activities and attributes a given society considers appropriate for men and women (<http://www.who.int/gender/whatisgender/en/index.html>).

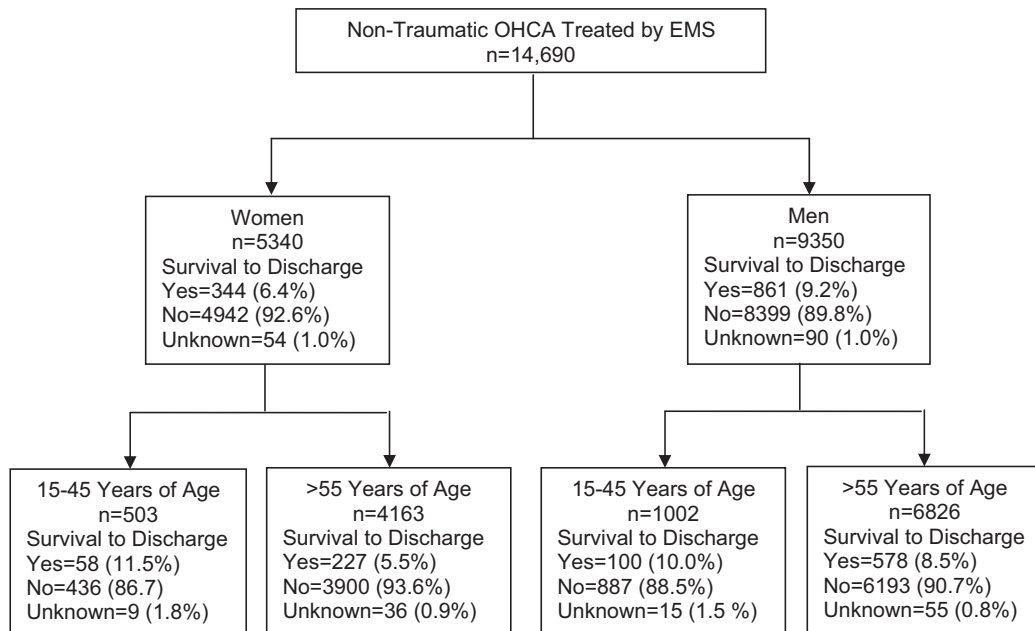


Fig. 1. Consort diagram.

and chronic care.^{11–21} For example, women are more likely to have a diagnosis of myocardial infarction missed in the Emergency Department, and are less likely to receive invasive diagnostic testing and treatments for cardiovascular diseases, such as cardiac catheterization and percutaneous coronary intervention—all of which might account for poorer outcomes and increased mortality.^{5,17,22–27}

Previous research on age and gender-based out of hospital cardiac arrest (OHCA) has shown contradictory findings.^{2,3,6,28–32} Kannel et al. reported lower rates of sudden cardiac arrest in women when compared to men.²⁸ Although one study² has reported that female gender was associated with an increased survival rate from OHCA, many studies have demonstrated that women have unfavourable outcomes in cardiac arrest with significantly lower unadjusted survival rates than men.^{31,33–35} These contradictory findings represent significant gaps in the epidemiology of OHCA and merit further investigation.

Our study objective was to use a large North American population based research quality database of sequential cases of OHCA to describe the relationship between gender, age, and outcomes (survival to hospital discharge) of OHCA patients and to stratify in two age cohorts⁸ to further investigate the potential impact of female reproductive hormones on survival outcomes. Considering the average age of first menarche in United States is 13 years³⁶ and the average age of menopause is 50 years³⁷ we have assumed that women in a younger age cohort (15–45 yoa) would have a high concentration of female reproductive hormones and would more likely have favourable survival outcomes compared to men of the same age.

Methods

Design

The Resuscitation Outcomes Consortium (ROC) Epistry-Cardiac Arrest registry is a prospective, population-based, multicentre, North American cohort study of non-traumatic OHCA.^{38,39} The ROC Epistry Study met the requirements for minimal risk research in the United States⁴⁰ and Canada⁴¹, and was approved for waiver of informed consent by 161 institutional research ethics boards.

Setting

ROC is a North American network of 10 US and Canadian sites that investigate OHCA (Fig. 1). ROC has one data coordinating centre and more than 260 participating EMS agencies serving approximately 23.7 million persons.³⁹

Study population

All eligible, consecutive, non-traumatic OHCA patients enrolled in the ROC Epistry between December 2005 and May 2007, prior to the start of the ROC intervention trials, were included. Eligible patients included individuals who experienced OHCA, and were evaluated and received attempted resuscitation by a participating ROC-affiliated EMS agency. Treated cardiac arrest was defined as external defibrillation (by lay responders or EMS personnel), or chest compressions delivered by EMS personnel. We excluded persons who were obviously dead and did not receive cardiopulmonary resuscitation (CPR) or defibrillation attempts.³⁸

Data definitions

The ROC Epistry-Cardiac Arrest database, data elements and quality assurance have been previously published.³⁸ Uniform data definitions were based on the Utstein elements.^{38,42–45} The Utstein elements include variables that are associated with survival; younger age, public location of the arrest, witnessed event (bystander or EMS witnessed), bystander CPR, a shockable (Ventricular tachycardia or Ventricular fibrillation) initial cardiac rhythm recorded by EMS personnel, and a short EMS response time interval. The quality of CPR process measures were compared across gender and age. If no obvious cause (for example, opioid overdose, strangulation, and drowning) of OHCA is determined based on review of the source documents, cardiac arrest was assumed to be of cardiac origin and eligible. The primary outcome was survival to hospital discharge as functional survival was not captured at this time. The secondary outcomes included death in the field, return of spontaneous circulation (ROSC), and sustained ROSC on arrival at the hospital. Patient age was analyzed as a continuous variable and a categorical variable (<21 years, 21–30, 31–40, 41–50, 51–60,

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