Public Access Defibrillators: Sex-Based Inequities in Access and Application for out-of-hospital cardiac arrest (OHCA)

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Presenter Disclosures

• Grants/Research Support: N/A
• Speakers Bureau: Stryker Corp.
• Unlabeled/Unapproved Uses Disclosure: N/A
Acknowledgements

• The Resuscitation Outcomes Consortium
• Prehospital clinicians, paramedics, first responders
• Michael Smith Foundation for Health Research
• Heart and Stroke Foundation of Canada
• BC Emergency Medicine Network
• Canadian Resuscitation Outcomes Consortium
Background – AED’s

• Earlier rhythm analysis and defibrillation improves patient outcomes

• Public Access Automatic External Defibrillator (AED) programs

• Bystander AED use remains low

Background – Sex Differences in Cardiac Arrest

• Previous studies have reported that women, in comparison to men,
  • Less likely to have bystander CPR performed
  • Lower overall survival
• Some of these differences may be related to:
  • differences in arrest location
  • Inequitable use and access to AED’s

Study Objectives

1. Are there systematic differences between men and women, with regards to arrest location?
2. Is sex associated with bystander AED application?
Methods

• Excluded: EMS untreated, EMS-witnessed cases, and age < 10, missing data
• We compared sex-based location differences:
  • public vs private location
  • location type:
    • Public: roadway, public building, place of recreation, industrial, other public property,
    • Private: home residence, farm or ranch, non-acute healthcare facility, residential institution, or other private location
• Among public location OHCAs with bystander interventions: logistic regression model for the association between sex and AED application
Cases enrolled in Epi 3 Dataset 2011 - 15  
**n = 120 305**

- Untreated **n = 53 101**
- Child **n = 1162**
- EMS-witnessed **n = 2464**

Missing Data on sex or location **n = 2105**

**Study Cohort n = 61 473**
- Public Location **n = 9163**
- Public Location with Bystander Resuscitation Attempt **n = 4968**
<table>
<thead>
<tr>
<th></th>
<th>Female n (%) or median (IQR)</th>
<th>Male n (%) or median (IQR)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number, n</strong></td>
<td>20 933</td>
<td>40 540</td>
</tr>
<tr>
<td><strong>Age, years</strong></td>
<td>71 (56 - 83)</td>
<td>66 (54 - 78)</td>
</tr>
<tr>
<td><strong>Witnessed Arrest, n</strong></td>
<td>7740 (39)</td>
<td>15704 (45)</td>
</tr>
<tr>
<td><strong>Public Location, n</strong></td>
<td>1852 (8.8)</td>
<td>7311 (18)</td>
</tr>
<tr>
<td><strong>Bystander CPR</strong></td>
<td>9662 (49)</td>
<td>17853 (51)</td>
</tr>
<tr>
<td><strong>9-1-1 Call to EMS arrival, min</strong></td>
<td>5.4 (4.1 – 6.8)</td>
<td>5.5 (4.3-7.0)</td>
</tr>
<tr>
<td><strong>Initial Shockable Rhythm, n</strong></td>
<td>3012 (15)</td>
<td>10585 (27)</td>
</tr>
<tr>
<td><strong>Survival to Discharge, n</strong></td>
<td>1589 (7.6)</td>
<td>4708 (12)</td>
</tr>
</tbody>
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Question 1:

Are there systematic differences between men and women, with regards to cardiac arrest location?
Public Out-of-Hospital Cardiac Arrests, Stratified by Sex

Female: 8.8% (95% CI 8.5 – 9.2)
Male: 18.0% (95% CI 17.7 – 18.4)
Location type of Out-of-Hospital Cardiac Arrest, Stratified by Sex

Location Type
- Street/Highway
- Public
- Recreation
- Industrial
- Other Public
- Home
- Farm
- Healthcare
- Residential
- Other

Proportion (%)

Female
Male
PUBLIC LOCATIONS

- Street/Highway
- Public Building
- Recreation
- Industrial
- Other Public
Question 2:

Is sex associated with bystander AED application?
Proportion with AED application, within location-based subgroups
Proportion with AED application, within location-based subgroups

Location Type

Proportion with AED Application (%)

Female

Male

- Street/Highway
- Public Building
- Recreation
- Industrial
- Other Public
- Home
- Farm
- Healthcare
- Residential
- Other Private
Logistic Regression Model

• Subgroup restricted to:
  • Public Location Arrest
  • Bystander Resuscitation Attempt

• Female sex was associated with a decreased odds of bystander AED application (adjusted OR 0.83, 95% CI 0.70 – 0.99).
Summary

• 60,000 EMS-treated OHCA’s throughout North America

• Women unlikely to have a cardiac arrest in a location with an AED

• Within the same public location type, women are less likely to have AED’s applied

• Subgroup of public locations & bystanders resuscitation: women still less likely to have AED’s applied
Why are women less likely to arrest in public?

• Not addressed by this analysis

• Possible explanations
  • Socioeconomic structures and domestic roles, especially of this age range
  • Different preceding symptoms; women may go home to rest?

How to optimizing alignment of AED’s with OHCA’s?

• Residential locations
• Residential Institution (12% AED application) and Non-Acute Healthcare Facilities (43% AED application)
How to achieve Early Response for Private Locations?

• Novel Crowd Sourcing Bystander Response Applications
• Wearable devices to detect cardiac arrest for unwitnessed cases
Dedicated Sex-Specific Training and Media Campaigns

• Why are women less likely to have bystander-applied AED’s?
  • Reasons unclear from this analysis
  • Possible explanations:
    • Bystanders may not recognize OHCA in women
    • May be less likely to expose the chest due to social barriers
Conclusions

• Public OHCA in women is infrequent
• Women are less likely to have PADs applied.
• Innovative strategies are needed
  • to align OHCA locations and AED’s placement
  • to train the public