Race and gender disparities and cardiac arrest outcomes

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Presenter Disclosure Information

• Raina Merchant, MD
• Title: Race and gender disparities and cardiac arrest outcomes

FINANCIAL DISCLOSURE: None

UNLABELED/UNAPPROVED USES DISCLOSURE: None
Background

• Blacks have worse survival from cardiac arrest compared with whites \(^1\)
• Factors underlying these racial disparities are likely complex
• In patients with AMI, comorbidities and hospital racial composition may play a role in differences in outcomes by race \(^2\)

• We sought to explore potential mechanisms generating disparities in outcomes for patients with cardiac arrest

\(^1\) Becker LB et al. NEJM 1993
\(^2\) Skinner J et al. Circ 2005
Specific Aims

1. Determine survival rates for black and white patients admitted to the hospital with cardiac arrest

2. Determine if differences in survival for blacks and whites are explained by adjusting for pre-arrest conditions and hospital factors (racial composition)
Admission diagnosis of cardiac arrest or VF  
\( N = 116,039 \)

Age \( \geq 66 \)  
\( N = 93,644 \)

Admission from the ED  
\( N = 69,239 \)

White or Black  
\( N = 65,861 \)

Excluded: Procedure, Diagnosis, or DRG code related to ICD replacement/check  
Discharged to home w/in 1 day of admission  
\( N = 63,067 \)

Inclusion: Procedure, Diagnosis or DRG codes for:  
Cardiac arrest, VF, mechanical ventilation, CPR, heart countershock  
Admission to an ICU  
\( N = 62,704 \)
Methods

Data sources:

Comorbidities:

Medpar, Outpt standard analytic file

Hospital level factors:

Medicare cost reports, American Hospital Association annual survey

Outcome:

Medpar, Medicare enrollment database death dates
Variables

Main outcome measure: disposition at discharge (alive or dead)

**Patient characteristics**
- Race, Gender, Age

**Arrest characteristics:**
- Admission diagnosis (VF or cardiac arrest)

**Index hospitalization characteristics:**
- Hospital /ICU LOS, Admission day of the week

**Pre-arrest comorbidities:**
- HTN, CAD, CHF, MI, Valvular dz, Arrhythmia, Renal dz, DM

**In-hospital concurrent conditions:**
- AMI, sepsis/shock, PE, CVA, Hyperkalemia, ACS

**Hospital characteristics**
- Bed days, academic, urban, hospital ownership, income, census region, % black patients, cardiovascular procedure capabilities
Statistics

Stata, version 10.1

Unadjusted estimates:
• Chi square, ttest, Kruskal Wallis

Adjusted estimates:
• Multivariable logistic regression model
  -Controlled for clustering by hospital
## Demographics

<table>
<thead>
<tr>
<th></th>
<th>White males (n=30,904)</th>
<th>White females (n=24,545)</th>
<th>Black males (n=2,815)</th>
<th>Black females (n=4,440)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age (mean)std, range</strong></td>
<td>77± 6.9</td>
<td>79± 7.6</td>
<td>76±7.2</td>
<td>78±8</td>
</tr>
<tr>
<td><strong>Admission diagnosis</strong></td>
<td>VF (42741)</td>
<td>14%</td>
<td>9%</td>
<td>9%</td>
</tr>
<tr>
<td>HOSPITAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Length of stay</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospital</td>
<td>5.3±7</td>
<td>4.7±7</td>
<td>6.4±8</td>
<td>6.4±9</td>
</tr>
<tr>
<td>ICU</td>
<td>2.7±5</td>
<td>2.4±4</td>
<td>3.4±6</td>
<td>3.4±6</td>
</tr>
</tbody>
</table>
Pre-arrest comorbidities

CAD, Arrhythmia, MI, Renal dz, HTN, Valvular dz, CHF, DM
In-hospital concurrent conditions
AMI, sepsis/shock, PE, CVA, Hyperkalemia, ACS
Characteristics of pts with arrest and hospital racial composition

Percentage of black patients per hospital (quintiles)

<table>
<thead>
<tr>
<th>Quintile</th>
<th>White arrest pts</th>
<th>Black arrest pts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lowest (&lt;1%)</td>
<td>1,184 (32%)</td>
<td>81</td>
</tr>
<tr>
<td>2nd (1-3%)</td>
<td>668 (18%)</td>
<td>278</td>
</tr>
<tr>
<td>3rd (3-6%)</td>
<td>588 (16%)</td>
<td>761</td>
</tr>
<tr>
<td>4th (6-13%)</td>
<td>561 (15%)</td>
<td></td>
</tr>
<tr>
<td>5th (&gt;13%)</td>
<td>755 (20%)</td>
<td>8,031</td>
</tr>
</tbody>
</table>

Total hospitals: 3,721
**Hospital characteristics by racial composition**

Black patients/hospital (quintile)

<table>
<thead>
<tr>
<th></th>
<th>Lowest</th>
<th>2nd</th>
<th>3rd</th>
<th>4th</th>
<th>5th</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Urban</strong></td>
<td>10%</td>
<td>21%</td>
<td>21%</td>
<td>24%</td>
<td>24%</td>
</tr>
<tr>
<td><strong>South</strong></td>
<td>5%</td>
<td>14%</td>
<td>22%</td>
<td>25%</td>
<td>33%</td>
</tr>
<tr>
<td><strong>Lg hospital vol</strong></td>
<td>8%</td>
<td>16%</td>
<td>24%</td>
<td>27%</td>
<td>24%</td>
</tr>
<tr>
<td><strong>Academic</strong></td>
<td>5%</td>
<td>9%</td>
<td>17%</td>
<td>27%</td>
<td>25%</td>
</tr>
<tr>
<td><strong>Government</strong></td>
<td>18%</td>
<td>13%</td>
<td>13%</td>
<td>22%</td>
<td>35%</td>
</tr>
<tr>
<td><strong>High income</strong></td>
<td>18%</td>
<td>22%</td>
<td>22%</td>
<td>21%</td>
<td>12%</td>
</tr>
</tbody>
</table>

*Hospital volume: bed days divided into terciles
**High income: representative zip codes from cardiovascular pts, divided into terciles
## Hospital procedure capabilities by racial composition

Black patients/hospital (quintile)

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Lowest</th>
<th>2nd</th>
<th>3rd</th>
<th>4th</th>
<th>5th</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac catheterization</td>
<td>17%</td>
<td>20%</td>
<td>21%</td>
<td>21%</td>
<td>21%</td>
</tr>
<tr>
<td>PCI</td>
<td>16%</td>
<td>20%</td>
<td>21%</td>
<td>22%</td>
<td>21%</td>
</tr>
<tr>
<td>CABG</td>
<td>15%</td>
<td>20%</td>
<td>22%</td>
<td>23%</td>
<td>21%</td>
</tr>
<tr>
<td>ICD</td>
<td>16%</td>
<td>20%</td>
<td>22%</td>
<td>22%</td>
<td>20%</td>
</tr>
</tbody>
</table>
Unadjusted survival to discharge by race/gender

- White males: 34%
- White females: 29%
- Black males: 27%
- Black females: 29%

Probability of survival
Adjusted by age, comorbidities: survival to discharge by race/gender

- White males: 32%
- White females: 28%
- Black males: 28%
- Black females: 30%

Probability of survival
Adjusted by age, comorbidities, inpt concurrent dx: survival to discharge by race/gender

- White males: 30%
- White females: 29%
- Black males: 30%
- Black females: 30%

Probability of survival
Adjusted by age, comorbidities, inpt dx, hospital factors: survival to discharge by race/gender

Probability of survival

- White males: 30%
- White females: 28%
- Black males: 31%
- Black females: 31%
Adjusted survival from cardiac arrest by race/gender and hospital racial composition

Probability of survival

%black patients/hospital, quintile

- White male
- White female
- Black male
- Black female
Key findings and significance

• Survival for black & white men & women was similar when adjusting for pre-arrest comorbidities and in-hospital diagnoses

• Survival was better for blacks when adjusting for hospital level factors

• Overall, survival for white men & women and black women was lowest at hospitals which provided care for higher percentages of black patients
Limitations

• Unable to account for mortality and race differences in arrests not resuscitated or unable to be resuscitated pre-hospital

• Some out-of hospital arrests may not have been captured (i.e. admission diagnosis coded as AMI or shock)

• Unable to measure use or non-use of therapeutic hypothermia
Next steps

Improve health equity in hospitals which provide care for high percentages of black patients and hospitals with low survival rates:

**Quantitative:**
- Resource capabilities
- Quality metrics, processes of care
- Identify “best practices” for post-resuscitation care

**Qualitative:**
- Discharge patterns
- End of life care
Thank you

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