Using Novel EMS Data Linkages to Evaluate the Timing and Quality of Pre-hospital STEMI Care

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Background

• Reperfusion in STEMI improves outcomes the faster it is instituted, PPCI cornerstone of treatment

• Chain of survival starts with the patient: quality metric of FMC-to-PCI <90min proposed

• National quality efforts focus on improving care processes of Emergency medical services (EMS)

Jakobs AK Circulation. 2007;116:689–692
Krumholz HM Circulation. 2008;118:2596-2648
American Heart Association’s Mission Lifeline
Background and Rationale

- No detailed pre-hospital data have been integrated with hospital data. Hospital are data abstracted from charts.
Objectives

Using a unique data linkage we aimed to

• Describe delays in pre-hospital STEMI care

• Examine how many patients reach the proposed quality metric of 90 minutes from FMC-to-PCI

• Compare EMS data with in-hospital registry data for assessing pre-hospital delay
Regionalization of STEMI care in NC

PPCI capable

Not PPCI capable
Methods: Data sources

- **Reperfusion of Acute Myocardial Infarction in North Carolina Emergency Departments (RACE) Study**
  - Voluntary registry of patients with STEMI in NC
  - Detailed information on in-hospital processes of care and outcomes in NC STEMI patients

- **The North Carolina statewide Prehospital Medical Information System (PreMIS)**
  - EMS entered data by more than 35,000 EMS professionals in more than 540 agencies
  - PreMIS covers all EMS runs in NC (>1 million/y)

% Reaching Goal of Door to Device or 1st Medical Contact to Device < 90 minutes

- Direct Walk-in: 61%
- Direct EMS: 36%
- Direct EMS: 50%

Jollis JG JAMA. 2007 Nov 28;298(20):2371-80
Methods: Base population and linkage

- STEMI patients in RACE from Jun 2008 to Sep 2010

- Linkage of data deterministically:
  - Date of birth
  - Gender
  - Arrival time and date at destination (<5 hours diff.)
  - Destination name
Patient selection and linkage

- Important for linkage: standardizing hospital names

RACE database – STEMI patients
June 2008 to September 2010
N=8,680

21 hospitals and 155 EMS agencies
N=6,010 (70%)

Unsuccessful linkage:
- Hospitals linkage rates 42-95%
- DOB missing 12%
- Gender missing 11%
## Results: Characteristics

<table>
<thead>
<tr>
<th></th>
<th>Linked patients</th>
<th>Not linked patients</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N=6010</td>
<td>N=2670</td>
<td></td>
</tr>
<tr>
<td>Age, median (IQR)</td>
<td>60 (51-70)</td>
<td>60 (51-70)</td>
<td>0.58</td>
</tr>
<tr>
<td>Females, %</td>
<td>30.7</td>
<td>29.9</td>
<td>0.46</td>
</tr>
<tr>
<td>History of, %</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Myocardial infarction</td>
<td>20.0</td>
<td>20.8</td>
<td>0.35</td>
</tr>
<tr>
<td>Diabetes</td>
<td>22.6</td>
<td>23.6</td>
<td>0.31</td>
</tr>
<tr>
<td>PCI</td>
<td>19.8</td>
<td>20.9</td>
<td>0.24</td>
</tr>
<tr>
<td>At admission, median (IQR)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Systolic BP, mmHg</td>
<td>138 (117-159)</td>
<td>138 (117-158)</td>
<td>0.23</td>
</tr>
<tr>
<td>In-hospital</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCI with stent, %</td>
<td>85.5</td>
<td>85.3</td>
<td>0.80</td>
</tr>
</tbody>
</table>
Results: Time delay

- EMS notification time: 1 (0-2)
- From ambulance notification to wheels rolling: 1 (0-2)
- From wheels rolling to scene arrival: 7 (5-10)
- From scene arrival to patient arrival: 1 (1-2)
- On scene with the patient: 14 (10-18)
- Transportation time from incident address to hospital: 17 (11-25)
- Time from hospital arrival to device: 55 (40-73)
Results: correlation, RACE vs. PreMIS

FMC-to-Door:

RACE: 34 (26-45)
PreMIS: 31.5 (24-41)
P < 0.0001

\[ r = 0.63 \]
Limitations

• Limited to NC
• Not able to examine self transported patients
• EMS agencies submit data differently
• No unified EMS system in NC
Conclusions

• Only half of all STEMI patients in NC reach the benchmark of 90 minutes from FMC-to-PCI
  – *Delays seem prone to*
    • In-hospital processes
    • Time spent with patient and EMS transport time from patient to PPCI capable center

• Supportive of using chart abstracted data for assessing the quality metric of time from FMC-to-PCI

• This linked database offers opportunities for novel studies of processes of pre-hospital care in STEMI
Acknowledgements

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  - Li Lin
  - Barbara Lytle