Implementation of myocardial system of care in a rural area in Brazil using telecardiology

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Conference for Global e-Health Grand Rounds
September, 2016

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Mortality of myocardial infarction is related to the time until medical treatment.

Boersma plot: meta-analytic data showing the association between time to reperfusion and benefit of thrombolytic drugs. Boersma et al, Lancet 1996; Vol. 348: 771-775

Systems of care were developed to allow the rapid transportation of STEMI to medical care to allow fibrinolysis or primary angioplasty.
Myocardial Infarction System of Care in the city of Belo Horizonte

- Tele-ECG to connects emergency units of Belo Horizonte to Coronary Care Unit and Telehealth Center to improve treatment for patients with myocardial infarction
Myocardial Infarction System of Care in the city of Belo Horizonte

- Flowchart for patients with acute myocardial infarction
- Tele-ECG was implemented in seven Emergency Units
- Emergency Units teams were trained
- Three Coronary care units (HCUFMG, Santa Casa, São José)
- Dedicated mobile for the communication between Emergency Departments (UPA) and CCUs
- Partnership between hospitals and City Health Department
Myocardial Infarction System of Care in the city of Belo Horizonte

- 2,576 ECGs in 2011/2012
- More use of reperfusion therapy
- Trend of reduction of hospital mortality

In-hospital mortality, MI, Belo Horizonte, 2009-14

- 2009: 12.3%
- 2010: 9.6%
- 2011: 7.1%
- 2012: 9.3%
- 2013: 8.8%
- 2014: 8.2%
The Minas Telecardio project 2- Implementation of a STEMI network in the North of Minas

North of Minas region
• Area: 128,454,108 km²
• Micro regions: 9
• Counties: 89
• Population: 1,6 mi
• Demographic density: 12,6 hab/km²
• HDI: medium-low
The Minas Telecardio project 2 - Implementation of a STEMI network in the North of Minas

- Integration of the emergency department of regional hospitals, pre hospital service (ambulance), coronary care and hemodynamic services to develop rapid diagnosis and treatment systems
- Implantation of Tele-ECG (digital-ECG):
  - in 48 units of ambulance in north of Minas
The Minas Telecardio project 2 - Baseline

583 cases de Acute Coronary Syndrome
- 306 (52.4%) Unstable Angina
- 204 (34.9%) STEMI
- 73 (12.5%) NSTEMI

• Mortality:
  - In-hospital: ACS 9.4%
  - In-hospital: STEMI 17.2%

• Reperfusion in STEMI patients: 46%
  - 88 primary PCI and six fibrinolysis

STEMI total mortality 20.3%
The Minas Telecardio project 2 – Protocol and patient flow definition

- Measurement of SAMU transportation times
- Selected municipality to primary PCI: Transfer time until 120 min
The Minas Telecardio project 2 – Protocol and patient flow definition

- Adaptation of the ACS Ministry of Health protocol to regional needs
- Presentation of flow proposal and ACS protocol at local meeting
The Minas Telecardio project 2 – Development of a teleECG solution

• Development of a tablet-based interface
• Tests with the digital ECG and tablet in SAMU ambulance
• Adaptation of the SAMU central regulation center to receipt and interpret ECGs obtained in ambulances
• ECG sent to cardiology hospitals
The Minas Telecardio project 2 – Extensive health care team training

Ambulance staff, physicians and nurses of the local hospitals were extensively trained with protocols of chest pain, acute coronary syndrome, prehospital fibrinolysis and STEMI. Training sessions lasted 8-hours and used simulation-based learning techniques and educational materials was given for all members.
The Minas Telecardio project 2 – STEMI medication kit for the ambulances

• Standardization of drug therapy in all phases of the treatment

• Medication Kit:
  • Tenecteplase
  • Aspirin
  • Clopidogrel
  • Enoxaparin
  • Beta-blockers
  • Nitrate
The Minas Telecardio project 2 – Results

Increase in the frequency of patients with suspected chest pain or MI that perform an ECG

Pre-hospital mortality

In-hospital mortality

Total mortality

Reduction of mortality after the intervention

# The Minas Telecardio project 2 – Results

Improvement in the frequency of evidence based drugs use in STEMI patients

<table>
<thead>
<tr>
<th>Medication</th>
<th>Before implementation</th>
<th>After implementation</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Medication in 24 hours</strong></td>
<td>N=208</td>
<td>N=143</td>
<td></td>
</tr>
<tr>
<td>Aspirin</td>
<td>196/208 (94.2)</td>
<td>143 (100.0)</td>
<td>0.003</td>
</tr>
<tr>
<td>P2Y12 inhibitor</td>
<td>182/208 (87.5)</td>
<td>143 (100.0)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Heparin</td>
<td>155/208 (74.5)</td>
<td>136 (95.1)</td>
<td>&lt;0.001</td>
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<tr>
<td>Statins</td>
<td>170/208 (81.7)</td>
<td>131 (91.6)</td>
<td>0.012</td>
</tr>
<tr>
<td><strong>Medication at discharge</strong></td>
<td>N=169</td>
<td>N=122</td>
<td></td>
</tr>
<tr>
<td>Aspirin</td>
<td>163 (96.4)</td>
<td>122 (100.0)</td>
<td>0.035</td>
</tr>
<tr>
<td>P2Y12 inhibitor</td>
<td>128 (75.7)</td>
<td>115 (94.3)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Statins</td>
<td>153 (90.5)</td>
<td>122 (100.0)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

The Minas Telecardio project 2 – Perspective

- STEMI system of care for all regions of the State of Minas Gerais
- AHA Get with the guidelines in Brazil (SBC/AHA/MS/Hcor)
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