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On behalf of Euro Heart Survey-ACS III investigators

No Conflict of Interest to Declare
Measuring Quality of Care

- Assessment of the quality of care: integral part of modern health care.
- Acute STEMI is a typical clinical situation where:
  - Quality of management has an important impact on outcomes.
  - RDZ studies have demonstrated clinical benefit of treatments.
  - Guidelines provide Class IA recommendations.
- Performance Measures (PM): method to assess the quality of care.
- Since 2006, ACC/AHA have defined PM for STEMI and reperfusion
  - Use of reperfusion in eligible patients.
  - Choice of strategy: fibrinolysis (FL) or primary PCI (P-PCI)
  - Time to reperfusion: door to needle, door to balloon times
- So far, PM for reperfusion are poorly used in European Centres.

Aim of the study: to assess Performance Measures for reperfusion therapy in Europe, and to examine temporal trends in PM over 4 periods of 6 months (2006-2008).

Massoudi, JACC 2006;52:2101
The EHS is an international clinical research programme aiming to provide a better understanding of medical practice based on observational data, collected with robust methodological procedures.

**EHS ACS** in 2000: 10484 ACS patients, 4431 STEMI

**EHS ACS II** in 2004: 6385 ACS patients, 3004 STEMI;

**EHS ACS III**: October 2006 to November 2008
- Centre participation on voluntary basis
- Inclusion of consecutive patients admitted the first week/month
- Only direct admissions (no transferred patients)
- Use of the CARDS variables (250 variables/patient)
- Self explanatory CRF provided by EHS team at the ESC

[More information](http://escardio.org/guidelines-surveys/ehs)
Participating centres

West: 2045 STEMI, 120 pts/centre
High volume centre: 36%
Cath lab on site: 100%

Mediterranean: 2425 STEMI, 60 pts/centre
High volume centre: 28%
Cath lab on site: 64%

Central: 3185 STEMI, 82 pts/centre
High volume centre: 14%
Cath lab on site: 58%
Definition of PM

(1) Rate of patients with reperfusion therapy, among those eligible (STEMI patients admitted <12h, without recorded contra indication for reperfusion)

(2) Rate of use of P-PCI and (3) of FL

(4) Rate and Type of reperfusion among “PCI-preferred” patients:
   • patients with a contra-indication for fibrinolysis,
   • admitted >4 hours after onset of symptoms,
   • with cardiogenic shock or with Killip class >3

(5) Door to needle time (admission to administration of FL)

(6) Rate of patients with FL <30 min among those reperfused by FL

(7) Door to artery time (admission to artery puncture)

(8) Rate of patients with P-PCI <90 min among reperfused by P-PCI

(9) Rate of patients timely reperfused = by primary PCI (door to artery time <90 min) or by FL (door to needle time <30 min).
Population

19205 Patients

7655 STEMI
11550 NSTEMI-ACS

Period #1
N=1920
- No ECG criteria
  - 75(3.9%)
- Admitted >12h or CI
  - 225(11.7%)
- Eligible Reperfusion
  - 1620(84.3%)
- Time information
  - 98%

Period #2
N=1912
- No ECG criteria
  - 52(2.7%)
- Admitted >12h or CI
  - 231(12.1%)
- Eligible Reperfusion
  - 1629(85.2%)
- Time information
  - 100%

Period #3
N=1913
- No ECG criteria
  - 64(3.3%)
- Admitted >12h or CI
  - 231(12.1%)
- Eligible Reperfusion
  - 1618(84.5%)
- Time information
  - 100%

Period #4
N=1910
- No ECG criteria
  - 49(2.6%)
- Admitted >12h or CI
  - 247(12.9%)
- Eligible Reperfusion
  - 1614(84.5%)
- Time information
  - 100%
# Patient characteristics

<table>
<thead>
<tr>
<th>Variables</th>
<th>Period 1 N=1920</th>
<th>Period 2 N=1912</th>
<th>Period 3 N=1913</th>
<th>Period 4 N=1910</th>
<th>P (trend)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>63(13)</td>
<td>64(13)</td>
<td>64(13)</td>
<td>64(13)</td>
<td>0.21**</td>
</tr>
<tr>
<td>Elderly (≥75)</td>
<td>434 (22%)</td>
<td>446 (23%)</td>
<td>455 (24%)</td>
<td>448 (24%)</td>
<td>0.29*</td>
</tr>
<tr>
<td>Male Gender</td>
<td>1374(71%)</td>
<td>1364(71%)</td>
<td>1363(71%)</td>
<td>1380(72%)</td>
<td>0.67*</td>
</tr>
<tr>
<td>Diabetes</td>
<td>385(20%)</td>
<td>416(22%)</td>
<td>484(25%)</td>
<td>438(23%)</td>
<td>0.005*</td>
</tr>
<tr>
<td>Admission SBP (mmHg)</td>
<td>135(29)</td>
<td>133(28)</td>
<td>134(27)</td>
<td>133(28)</td>
<td>0.18**</td>
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<tr>
<td>Creatinine</td>
<td>88[75;106]</td>
<td>88[76;106]</td>
<td>88[75;106]</td>
<td>88[75;106]</td>
<td>0.41**</td>
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<tr>
<td>Killip Class&gt;2</td>
<td>188(9.8%)</td>
<td>157(8.2%)</td>
<td>125(6.5%)</td>
<td>135(7.1%)</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>GRACE score</td>
<td>152(40)</td>
<td>154(39)</td>
<td>153(37)</td>
<td>156(39)</td>
<td>0.15**</td>
</tr>
</tbody>
</table>

*Cochran Armitage test  **Jonckheere Terpstra test
PM for reperfusion

Cochran Armitage test

Eligible; $p=0.95$

Reperfusion; $p=0.0007$

<table>
<thead>
<tr>
<th>Period</th>
<th>Eligible</th>
<th>Reperfusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>84.4%</td>
<td>77.2%</td>
</tr>
<tr>
<td>2</td>
<td>85.2%</td>
<td>80.7%</td>
</tr>
<tr>
<td>3</td>
<td>84.6%</td>
<td>82.5%</td>
</tr>
<tr>
<td>4</td>
<td>84.5%</td>
<td>81.7%</td>
</tr>
</tbody>
</table>
PM for reperfusion

- Eligible; p=0.95
- Reperfusion; p=0.0007
- P-PCI; p<0.0001
- FL; p<0.0001

Period 1: 51.7% Eligible, 25.4% P-PCI, 60.0% Reperfusion, 62.6% FL
Period 2: 60.0% Eligible, 20.7% P-PCI, 70.0% Reperfusion, 62.6% FL
Period 3: 62.6% Eligible, 19.9% P-PCI, 80.0% Reperfusion, 64.0% FL
Period 4: 64.0% Eligible, 17.3% P-PCI, 80.0% Reperfusion, 64.0% FL

Cochran Armitage test
PM for reperfusion

Eligible; p=0.95
Reperfusion; p=0.0007
P-PCI; p<0.0001
FL; p<0.0001
P-PCI<90; p<0.0001
FL<30; p=0.0081
Timely Rep; p<0.0001

Cochran Armitage test
Trends in times to reperfusion

Onset to needle: 150 [90; 240] to 130 [90; 210]  
Door to needle: 20 [10; 34] to 15 [-37; 30]

p=0.0011 for trend
p=0.0080 for trend

Period 1
- Onset to Door: 20 [10; 34]  
- Door to Needle: 20 [10; 34]

Period 2
- Onset to Door: 20 [10; 34]  
- Door to Needle: 20 [10; 34]

Period 3
- Onset to Door: 15 [90; 240]  
- Door to Needle: 15 [-37; 30]

Period 4
- Onset to Door: 15 [90; 210]  
- Door to Needle: 15 [-37; 30]

Jonckheere-Terpstra test
Trends in times to reperfusion

Time (min)

Door to artery: 60 [27; 119] to 45 [26; 84]  
Onset to artery: 240 [155; 290] to 230 [145; 386]  

Door to artery: 60 [27; 119] to 45 [26; 84]  
Onset to artery: 240 [155; 290] to 230 [145; 386]  

Period 1  
FL  
20  
Onset to Door

Period 2  
P_PCI  
60  
Door to Needle

Period 3  
FL  
20  
Door to Door

Period 4  
P_PCI  
53  
Door to Artery

Period 3  
P_PCI  
50  
Door to Artery

Period 4  
P_PCI  
45  
Door to Artery

p<0.0011 for trend  
p=0.056 for trend

Jonckherre-Terpstra test
Results: In-Hospital events

- Combined, $p=0.006$
- Death, $p=0.047$
- Major Bleed, $p=0.36$
- Re-infarction, $p<0.001$
- Stroke; $p=0.49$

Cochran Armitage test
Interactions: timely reperfusion (FL<30min or PPCI<90min)

<table>
<thead>
<tr>
<th></th>
<th>Odds ratio</th>
<th>Lower limit</th>
<th>Upper limit</th>
<th>p-Value</th>
<th>p-Value * Interaction</th>
<th>Odds ratio and 95% CI</th>
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<tr>
<td>Male</td>
<td>1.330</td>
<td>1.200</td>
<td>1.474</td>
<td>0.000</td>
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<td>Female</td>
<td>1.410</td>
<td>1.210</td>
<td>1.643</td>
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<td>Elderly</td>
<td>1.470</td>
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<td>Non Elderly</td>
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<td>1.210</td>
<td>1.484</td>
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<tr>
<td>Diabetes</td>
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<td>1.190</td>
<td>1.718</td>
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<td>0.72</td>
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<tr>
<td>No Diabetes</td>
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<td>1.240</td>
<td>1.514</td>
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<td>Off Hours Admission</td>
<td>1.420</td>
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<td>Working Hours</td>
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<td>1.110</td>
<td>1.453</td>
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<td>Low Volume centre</td>
<td>1.430</td>
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<td>1.573</td>
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<tr>
<td>High volume centre</td>
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<td>1.260</td>
<td>1.858</td>
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<tr>
<td>Cath lab on site</td>
<td>1.340</td>
<td>1.270</td>
<td>1.414</td>
<td>0.000</td>
<td>0.48</td>
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<tr>
<td>No cath lab on site</td>
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<td>1.190</td>
<td>1.891</td>
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<td>University centre</td>
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<td>Non University</td>
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<td>1.594</td>
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<tr>
<td>Centres &gt;10 pts/period</td>
<td>1.320</td>
<td>1.200</td>
<td>1.452</td>
<td>0.000</td>
<td>0.006</td>
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<tr>
<td>Centres &lt;10pts/period</td>
<td>0.810</td>
<td>0.650</td>
<td>1.009</td>
<td>0.061</td>
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<tr>
<td>Cardio on site 24/7</td>
<td>1.140</td>
<td>1.000</td>
<td>1.300</td>
<td>0.050</td>
<td>0.76</td>
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<tr>
<td>No cardio on site 24/7</td>
<td>1.780</td>
<td>1.480</td>
<td>2.141</td>
<td>0.000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Less in 2007-2008

More in 2007-2008

*Breslow Day test
Discussion - Limitations

In EHS ACS III, all PM for reperfusion were comparable to those reported in US and international registries (NRMI, GRACE).

Reperfusion rates have increased gradually over the course of the 3 EHS ACS: 55.3% in 2000, 63.9% in 2004, 81.1% in 2008.
Discussion - Limitations

In EHS ACS III, all PM for reperfusion were comparable to those reported in US and international registries (NRMI, GRACE).

Reperfusion rates have increased gradually over the course of the 3 EHS ACS: 55.3% in 2000, 63.9% in 2004, 81.1% in 2008.

Changes in all PM with parallel decrease in in-hospital mortality are consistent with an increase in Quality of the Management.

Extent of the temporal changes: comparable to that observed with specific programs (D2B campaign, RACE, GWTG).

Limitations: Results not applicable for transferred patients.

Door to artery vs door to balloon

Selection of patients? GRACE risk score and in-hospital mortality rate consistent with a non selected population.

Selection of participating centres motivated by the quality of care?
Conclusions

Euro Heart Survey ACS III provides reassuring news:

- Average reperfusion rate among eligible patients: 80.4%
- Door to needle time = 20 min [IQR -15; 31]
- Door to artery time = 50 min [IQR 27; 100]

Between October 2006 and November 2008, we observed a significant and rapid improvement in the rate, modalities and time to reperfusion. Timely reperfusion not achieved in 25%.

Is it time for ESC to define PM in the management of ACS? Ongoing EHS ACS Snapshot will continue to assess the management of ACS.

Reperfusion strategy in Europe: temporal trends in performance measures for reperfusion therapy in ST-elevation myocardial infarction

http://eurheartj.oxfordjournals.org