Transfers, Facilitated and Rescue PCI for AMI

Michael J Cowley, M.D., MSCAI

Nothing to disclose
Lysis vs Transport for PCI
Meta-analysis of 5 RCT

Keeley EC
Lancet
2003; 361: 13-20

Average transfer time = 39 min

Death: PCI 7.3, Lysis 9.5 (p=0.057)
Re MI: PCI 2.2, Lysis 7.2 (p<0.0001)
Total CVA: PCI 1.1, Lysis 2.3 (p<0.05)
ICH: PCI 0, Lysis 1.9 (p=0.25)
Death, MI, CVA: PCI 15.8, Lysis 9.1 (p<0.0001)

Keeley EC Lancet 2003; 361: 13-20
Transfer for Primary PCI vs Lysis
Death, Re-MI, Stroke

Maastricht
PRAGUE
Air-Pami
CAPTIM
DANAMI 2
PRAGUE 2
Total

<table>
<thead>
<tr>
<th></th>
<th>PCI</th>
<th>Lysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maastricht</td>
<td>8/75</td>
<td>14/75</td>
</tr>
<tr>
<td>PRAGUE</td>
<td>8/101</td>
<td>23/99</td>
</tr>
<tr>
<td>Air-Pami</td>
<td>6/71</td>
<td>9/66</td>
</tr>
<tr>
<td>CAPTIM</td>
<td>26/421</td>
<td>34/419</td>
</tr>
<tr>
<td>DANAMI 2</td>
<td>63/790</td>
<td>107/782</td>
</tr>
<tr>
<td>PRAGUE 2</td>
<td>36/429</td>
<td>64/421</td>
</tr>
<tr>
<td>Total</td>
<td>147/1887</td>
<td>251/1863</td>
</tr>
</tbody>
</table>

OR: 0.58  p<0.001

Dalby M et al: Circ; 2003; 108: 1809
DANAMI-2
Primary Endpoint (Death, re-MI, CVA)

Average transfer time = 68 min
Fibrinolysis (front loaded tPA)
Log rank: p=0.002
PCI

NNT=18
14.2%
8.5%

DANAMI-2
Time Delay Is Important with Primary PCI
Transfers, Facilitated and Rescue PCI

Delays due to Long Transfer Times are common

- Only 25% of US hosp are capable of Primary PCI
- 82% of STEMI pts transferred from non-PCI hospitals for Primary PCI have Door to Balloon times > 120 min (ACC/NCDR) Chakrabarti, JACC 2008
Primary PCI: Access in US

42% PCI hospital is closest facility
79% within 60 min prehospital time*

* Weather permitting
Relation Between D2B Times and In-Hospital Mortality in NRMI

Treatment Delays with 1° PCI

Cardiac Survival

Door–to–Balloon Time
- 0 – 1.4 hr
- 1.5 – 1.9 hr
- 2.0 – 2.9 hr
- ≥ 3.0 hr

% 100
90
80
70
60
50
0 1 2 3 4 5 6 7 8 9 10 11
Years

p < 0.0001

n = 2,300

0-90 min
90-120 min
120-180 min
180 min

Transfer Door-to-Door Times and Outcome

1 year Mortality (n=616 pts)

- <30' : 3.2%
- 30-60' : 6.4%
- 60-90' : 6.2%
- >90' : 12.1%

$p=0.01$

De Luca G: AJC 2005; 95: 1361
Association of Door-In to Door-Out Time With Reperfusion Delays and Outcomes Among Patients Transferred for Primary Percutaneous Coronary Intervention

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Harlan M. Krumholz, MD, SM
Shuang Li, MS
Matthew T. Roe, MD, MHS
James C. Jollis, MD
Alice K. Jacobs, MD
David R. Holmes, MD
Eric D. Peterson, MD, MPH
Henry H. Ting, MD, MBA

Context Patients with ST-elevation myocardial infarction (STEMI) requiring interhospital transfer for primary percutaneous coronary intervention (PCI) often have prolonged overall door-to-balloon (DTB) times from first hospital presentation to second hospital PCI. Door-in to door-out (DIDO) time, defined as the duration of time from arrival to discharge at the first or STEMI referral hospital, is a new clinical performance measure, and a DIDO time of 30 minutes or less is recommended to expedite reperfusion care.

Objective To characterize time to reperfusion and patient outcomes associated with a DIDO time of 30 minutes or less.

Design, Setting, and Patients Retrospective cohort of 14,821 patients with STEMI transferred to 298 STEMI receiving centers for primary PCI in the ACTION Registry—Get With the Guidelines between January 2007 and March 2010.

Main Outcome Measures Factors associated with a DIDO time greater than 30 minutes, overall DTB times, and risk-adjusted in-hospital mortality.

Results Median DIDO time was 68 minutes (interquartile range, 43-120 minutes), and only 1627 patients (11%) had DIDO times of 30 minutes or less. Significant factors associated with a DIDO time greater than 30 minutes included older age, female sex, off-hours presentation, and non-emergency medical services transport to the first hospital. Patients with a DIDO time of 30 minutes or less were significantly more likely...
STEMI Transfer for pPCI
Door-in Door-out Times (ACTION Registry)

N=14,821 pts

11% 33% 20% 35% > 90 min

Wang TY et al: JAMA 2011; 305: 2540-2547
Door-in Door-Out Time and In-Hosp Mortality

N = 14,821 pts at 281 receiving hosp (Jan 2007-March 2010)

Adjusted Odds Ratio: 1.56 (1.15 - 2.12)

Wang TY: JAMA 2011;305:2540-2547
Door-in Door-Out Time and In-Hosp Mortality

N=14,821 pts at 281 receiving hosp (Jan 2007-March 2010)

ACTION Registry (GWTG)

Wang TY: JAMA 2011;305:2540-2547
Rescue PCI is better than Lysis!
RESCUE PCI: REACT Trial

Primary End Point (D, re-MI, severe CHF, CVA) at 6 mo

Rescue PCI: 84.6%
Conservative: 70.1%
Repeat Lysis: 68.7%

p=0.004

REACT = Rescue Angioplasty versus Conservative Treatment or Repeat Thrombolysis

Rescue Angioplasty or Repeat Fibrinolysis After Failed Fibrinolytic Therapy for ST-Segment Myocardial Infarction

A Meta-Analysis of Randomized Trials

Harindra C. Wijeysundera, MD,* Ram Vijayaraghavan, MD,* Brahmajee K. Nallamothu, MD, MPH,† JoAnne M. Foody, MD,‡§ Harlan M. Krumholz, MD, SM,‡∥ Christopher O. Phillips, MD, MPH,¶ Amir Kashani, MD, MS,‡ John J. You, MD,#†† Jack V. Tu, MD, PhD,**†† Dennis T. Ko, MD, MSc*††

Ontario, Canada; Ann Arbor, Michigan; New Haven and West Haven, Connecticut; and Cleveland, Ohio

JACC 2007; 49: 422-430
Rescue PCI vs Conservative Rx

Meta-analysis of 3 RCT (n=700 pts)

Wijeysundera HC: JACC 2007; 49:422-430

![Bar chart showing comparison between Rescue PCI and Conservative Rx for various outcomes: Death (0.09), re-MI (0.04), HF (0.05), CVA (0.04).]
“Facilitated” PCI
Facilitated PCI

• Was inferior to pPCI with short transfer times
• Was harmful in ASSENT 4
  • Study had serious design flaws
• Did not address key question:
  • Best Rx for pts with long transfer delays?
Reperfusion Options for Transfer Patients with Expected Delays

- Primary PCI (no matter how long it takes)
- Lysis; ischemia-guided transfer for rescue PCI
- Lysis with transfer for immediate ("early" PCI): Pharmaco-invasive strategy
Facilitated or Pharmaco-invasive

- AMICO Registry
- CARESS-in-AMI
- TRANSFER-AMI
- NOR-DISTEAMI
AMICO Registry: Pharmacoinvasive Rx
30 day Outcomes

Early Invasive vs Ischemia-guided Rx after Lysis for STEMI: Meta-analysis

### Death

<table>
<thead>
<tr>
<th>Study name</th>
<th>OR (95% CI)</th>
<th>Invasive</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>WEST</td>
<td>0.23 (0.03 – 2.12)</td>
<td>1 / 104</td>
<td>4 / 100</td>
</tr>
<tr>
<td>CAPITAL AMI</td>
<td>0.98 (0.19 – 4.97)</td>
<td>3 / 86</td>
<td>3 / 84</td>
</tr>
<tr>
<td>GRACIA 1</td>
<td>0.55 (0.24 – 1.27)</td>
<td>9 / 248</td>
<td>16 / 251</td>
</tr>
<tr>
<td>SIAM 3</td>
<td>0.41 (0.12 – 1.39)</td>
<td>4 / 82</td>
<td>9 / 81</td>
</tr>
<tr>
<td>PRAGUE 1</td>
<td>0.61 (0.28 – 1.35)</td>
<td>12 / 100</td>
<td>18 / 99</td>
</tr>
<tr>
<td>TOTAL</td>
<td>0.55 (0.34 - 0.90)</td>
<td>29 / 620</td>
<td>50 / 615</td>
</tr>
</tbody>
</table>

\[ P = .02 \]

Test for heterogeneity: Q-value 1.35 df 4 (p 0.85) I^2 0

### Reinfarction

<table>
<thead>
<tr>
<th>Study name</th>
<th>OR (95% CI)</th>
<th>Invasive</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>WEST</td>
<td>0.62 (0.21 – 1.81)</td>
<td>6 / 104</td>
<td>9 / 100</td>
</tr>
<tr>
<td>CAPITAL AMI</td>
<td>0.37 (0.12 – 1.10)</td>
<td>5 / 86</td>
<td>12 / 84</td>
</tr>
<tr>
<td>GRACIA 1</td>
<td>0.59 (0.25 – 1.38)</td>
<td>9 / 248</td>
<td>15 / 251</td>
</tr>
<tr>
<td>SIAM 3</td>
<td>0.99 (0.14 – 7.18)</td>
<td>2 / 82</td>
<td>2 / 81</td>
</tr>
<tr>
<td>PRAGUE 1</td>
<td>0.46 (0.17 – 1.29)</td>
<td>6 / 100</td>
<td>12 / 99</td>
</tr>
<tr>
<td>TOTAL</td>
<td>0.53 (0.33 - 0.86)</td>
<td>28 / 620</td>
<td>50 / 615</td>
</tr>
</tbody>
</table>

\[ P = .01 \]

Test for heterogeneity: Q-value 1.01 df 4(p 0.91) I^2 0

Wijeysundera HC: AHJ 2008; 156: 564-572
Early Routine PCI vs Standard Rx after Lysis
7 RCT (n=2961 pts)
30 Day Clinical Outcomes

* Rescue PCI: 20%

Borgia F: EHJ 2010; 31: 2156-2169
CARESS in AMI: Design

Reteplase
UFH bolus (max 3000 + IV at 7 U/kg/h)
Abciximab bolus + IV
ASA 300-500 mg iv

Facilitated PCI
UFH (7 U/Kg/h) for transfer
PCI: ACT adjusted to 200-250” ; UFH stopped after PCI

Medical Treatment/ Rescue
UFH (7 U/Kg/h for 24 hrs) If
Rescue PCI: ACT adjust to 200 - 250”; UFH stopped after PCI

Clopidogrel for 1-12 mo after stenting (514 pts; 82%)
Primary Outcome at 30 days

Death, re-MI, refractory ischaemia

OR 0.34 (95% CI 0.17-0.68)

p = 0.001

'C facilitated' 4.1%

Rescue 11.1%

DiMario C: Lancet 2008; 371:559-568
Pharmacoinvasive vs Lysis for high risk STEMI

Primary Endpoint* at 30 Days

N=1,004 pts

OR=0.54 (0.37, 0.78)

p=0.0013

*Primary EP: Death, re-MI, CHF, Severe re-ischemia, Shock
## 2013 STEMI Guidelines

### Fibrinolytic Therapy

<table>
<thead>
<tr>
<th>Indication for Lysis</th>
<th>CoR</th>
<th>LOE</th>
</tr>
</thead>
<tbody>
<tr>
<td>No contraindication; &lt;12h; time to PCI &gt;120 min from FMC</td>
<td>I</td>
<td>A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>After Fibrinolysis</th>
<th>CoR</th>
<th>LOE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tx to PCI center reasonable; angio when feasible (not within 2-3 hr)</td>
<td>IIA</td>
<td>B</td>
</tr>
<tr>
<td>Immed Tx for Shock or HF</td>
<td>I</td>
<td>B</td>
</tr>
<tr>
<td>Urgent Tx if failed lytics or reocclusion</td>
<td>IIA</td>
<td>B</td>
</tr>
</tbody>
</table>
Transfer, Facilitated and Rescue PCI

Summary

- Primary PCI is preferred for STEMI
- Primary PCI preferred if transfer times are short
- Pharmacoinvasive strategy is preferred for when transfer times are long
- Early “routine” PCI after lysis is preferred over rescue strategy (particularly in high risk pts)
  - Includes rescue PCI for failed reperfusion
  - Prevents early reocclusion after successful lysis