Reducing Time to Treatment for ST-Segment Elevation Myocardial Infarction (STEMI)

D2B: An Alliance for Quality
### Before myocardial infarction

- No symptoms
- Normal electrocardiogram
- Plaque

### During myocardial infarction

- Acute onset of chest pain
- Elevations of ST segment
- Occlusive thrombus
- Plaque

### Primary balloon angioplasty

- Chest pain resolving
- Resolving ST-segment elevation
- Deflated balloon
- Ischemic myocardium
- Restoration of blood flow

### Primary stent placement

- Chest pain resolving
- Resolving ST-segment elevation
- Stent
- Wire
- Non-flow-limiting plaque
- Restoration of blood flow
Time and Myocardial Salvage

Opening the artery is the primary goal (PCI > lysis)

Potential outcomes
- A – B — no benefit
- A – C — benefit
- B – C — benefit
- E – D — harm

Gersh et al, JAMA. 2005;293:979
Importance of Prompt Treatment

Prompt treatment increases the likelihood of survival for patients with myocardial infarction with ST-segment elevation (Berger et al., 1999; Cannon et al., 2000, McNamara et al., 2006).

McNamara et al., JACC, 2006
Practice does not meet national guidelines, and performance is not improving.

McNamara et al, JACC, 2006
National trend in median door-to-balloon time, 1999-2003

McNamara et al, JACC, 2006
However, there is substantial hospital-level variation in median door-to-balloon times
Key Question

• What is ‘it’ about the best hospitals?
Time Intervals in fastest and slowest quintiles of hospitals

Bradley et al, AHJ, 2006
Systems that Work

“Strategies” linked to significantly shorter DTB times

• Systems for activating cath lab
• Systems for handoff from ED to cath lab
• Systems for interaction with EMS
• Systems for data feedback & analysis

Bradley et al, NEJM, 2006
Identified achievable process

PATH #1
Pt has symptoms and calls EMS
EMS does ECG
Is STEMI suspected?
Yes
EMS notifies ED of STEMI, starts IV, draws blood
ED calls operator to page cath lab staff & interventionalist
Are pages confirmed?
Yes*
No*
Pt arrives at ED triage
Pt arrives in ED without pre-hospital ECG
Cath lab staff & interventionalist arrive and scrub within 30 minutes
Path #2
ED initiates treatment and consent for cath lab
ED communicates with cath lab to determine readiness to receive patient
ED transports patient to cath lab
Final check & written consent completed
Is PCI indicated?
Yes* Start procedure
No*
Continue ED work-up and cancel cath lab, as needed
No*
Admit patient to CCU
**Identified achievable benchmarks**

<table>
<thead>
<tr>
<th>Step</th>
<th>Minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. EMS arrives with patient at triage in ED; STEMI confirmed</td>
<td>0 5 10 15 20 25 30 35 40 45 50 55 60</td>
</tr>
<tr>
<td>2. ED stabilizes patient; initiates MI protocol; communicates with cath lab</td>
<td></td>
</tr>
<tr>
<td>3. ED transports patient to cath lab</td>
<td></td>
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<tr>
<td>4. Final check and written consent</td>
<td></td>
</tr>
<tr>
<td>5. Catheterization and PCI</td>
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- Patient arrives in cath lab
- Patient reperfusion

<table>
<thead>
<tr>
<th>Step</th>
<th>Minutes</th>
</tr>
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<tbody>
<tr>
<td>1. Pt arrives in ED, ECG is completed, ED physician diagnoses STEMI</td>
<td>0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80</td>
</tr>
<tr>
<td>2. ED calls operator to page on-call cath lab staff and interventionalist</td>
<td></td>
</tr>
<tr>
<td>3. ED stabilizes pt; initiates MI protocol; communicates with cath lab</td>
<td></td>
</tr>
<tr>
<td>4. Cath lab staff and interventionalist go to and arrive at cath lab</td>
<td></td>
</tr>
<tr>
<td>5. ED transports patient to cath lab</td>
<td></td>
</tr>
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<td>6. Final check and written consent</td>
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- Patient arrives in cath lab
- Patient reperfusion

Bradley et al, *JACC*, 2005
Key strategies associated with reduced D2B times

<table>
<thead>
<tr>
<th>Strategies</th>
<th>Minutes saved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activate lab with EM physicians (23% do this)</td>
<td>8.2 minutes</td>
</tr>
<tr>
<td>Activate w/single call from ED to operator (14%)</td>
<td>13.8 minutes</td>
</tr>
<tr>
<td>Activate based on information from pre-hospital ECG while patient is still en route to hospital (9%)</td>
<td>15.4 minutes</td>
</tr>
<tr>
<td>Expect cath team to arrive in 20-30 mins (13%)</td>
<td>19.3 minutes</td>
</tr>
<tr>
<td>Provide real-time data feedback to ED/lab (42%)</td>
<td>8.6 minutes</td>
</tr>
<tr>
<td>Have attending cardiologist always on site (4%)</td>
<td>14.6 minutes</td>
</tr>
</tbody>
</table>

Bradley et al, NEJM, 2006
Effective Strategies

Study finds six hospital interventions significantly reduce door-to-balloon times

Door-to-balloon times reduced by...

- 8.2 minutes
- 8.6 minutes
- 13.8 minutes
- 14.6 minutes
- 15.4 minutes
- 19.3 minutes

- Having ED physician activate the cath lab
- Providing real-time feedback to ED and cath lab staff
- Using a single-call page system
- Staffing a full-time attending cardiologist on site
- Having EMS diagnose STEMI en-route to the hospital and alert the ED
- Requiring cath lab staff to arrive within 20 minutes of being paged

Source: Bradley et al., NEJM, 11/30/06

Bradley et al, NEJM, 2006
### DTB Time & No. of Key Strategies Used

<table>
<thead>
<tr>
<th>Strategies</th>
<th>Hospitals (%)</th>
<th>Median DTB</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>137 (38.8)</td>
<td>110</td>
</tr>
<tr>
<td>1</td>
<td>130 (35.9)</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>56 (15.5)</td>
<td>88</td>
</tr>
<tr>
<td>3</td>
<td>31 (8.6)</td>
<td>88</td>
</tr>
<tr>
<td>4</td>
<td>8 (2.2)</td>
<td>79</td>
</tr>
</tbody>
</table>

Overall P value for trend: < .001

*Bradley et al, NEJM, 2006*
<table>
<thead>
<tr>
<th>Median door-to-balloon time</th>
<th>% of hospitals</th>
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<tbody>
<tr>
<td>≤ 90 minutes</td>
<td>31%</td>
</tr>
<tr>
<td>91 - 120 minutes</td>
<td>50%</td>
</tr>
<tr>
<td>121 - 150 minutes</td>
<td>14%</td>
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<tr>
<td>&gt; 150 minutes</td>
<td>5%</td>
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Translation into practice

National campaign to enroll hospitals in nationwide “collaborative” to implement evidence-based strategies to reduce door-to-balloon time

→ D2B: An Alliance for Quality
D2B Alliance

http://www.d2balliance.org/

American Heart Association (AHA), BlueCross BlueShield Association, Expecting Success, HCA Society of Chest Pain Centers, The Society for Cardiovascular Angiography and Interventions (SCAI), United HealthCare VHA, Inc., WellPoint, Aetna, American College of Cardiovascular Administrators, Emergency Medicine Cardiac Research and Education Group (EMCREG), FMQAI (Florida Quality Improvement Organization), Institute for Healthcare Improvement (IHI), Premier, Inc., Agency for Healthcare Research and Quality (AHRQ), Alliance for Cardiac Care Excellence (ACE), American Health Quality Association (AHQA), Joint Commission on Accreditation of Healthcare Organizations (JCAHO), National Association of EMS Physicians (NAEMSP), National Heart, Lung and Blood Institute, Society for Academic Emergency Medicine (SAEM)
**Goal:** D2B within 90 minutes in 75% of patients for Alliance hospitals

- Participation
- Intervention
- Impact
- Future
Participation

• 600+ Hospitals
• Community of institutions making a promise to provide timely primary PCI
Intervention

- Administrative support
- 6 processes
- Survey: diagnosis/prescription
- Products
- Partnerships
D2B Alliance recommendations to achieve goal of 75% within 90 minutes

• Evidenced-based strategies:
  – ED physician activates the catheterization lab
  – One call activates the catheterization lab
  – Catheterization team ready in 20 – 30 minutes
  – Prompt data feedback
  – Senior hospital management commitment
  – Team-based approach
  – *Optional:* Activate based on pre-hospital ECG
Impact

- Evaluation
  - Survey
  - Registries
  - HQA
  - Interviews
Other Objectives

- Develop QI network
- Develop template for future QI initiatives
- Create opportunities for volunteers
- Intergrate ABIM PIM and CME into QI
- Bring research into practice
• http://www.hospitalcompare.hhs.gov/
• http://www.d2balliance.com