EMS EKG Transmission and STEMI Team Activation

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Objectives

- Discuss potential for ED by-pass
- Discuss connection between EMS and hospital staff
- Discuss how cath lab is activated/staff is notified
- Discuss single call line “STEMI Alert Line”
- Discuss false positive activation of cath lab
TL

- 63 year old man
  - Hyperlipidemia
  - Stent to RCA in 1995
- 13:30: Onset of Chest Pain
- 13:40: EMS on scene
- 13:51: ECG performed and transmitted.
  - Nitroglycerin x 2
  - Aspirin, 325 mg
- 13:57: In route
ECG received at receiving station

Name: [redacted]
ID: [redacted]
Patient ID: [redacted]
Incident ID: 1035424
Age: 63
Sex: M

12-Lead 3:
S/T 0.132s
PR 0.132s
QT/QTc 0.408s/0.431s

PQRST-T Axes:
aVR 35 31 -7

HR 67bpm
QRS 0.096s

*** ACUTE MI SUSPECTED ***

Abnormal ECG **Unconfirmed**
Normal sinus rhythm
Anteroseptal infarct, possibly acute
T wave abnormality, consider inferior ischemia

ST measurements are measured at the median point and are expressed in mm.

<table>
<thead>
<tr>
<th>I</th>
<th>II</th>
<th>III</th>
<th>aVR</th>
<th>aVL</th>
<th>aVF</th>
<th>V1</th>
<th>V2</th>
<th>V3</th>
<th>V4</th>
<th>V5</th>
<th>V6</th>
</tr>
</thead>
<tbody>
<tr>
<td>-0.54</td>
<td>-1.13</td>
<td>-0.59</td>
<td>0.83</td>
<td>0.04</td>
<td>-0.88</td>
<td>2.44</td>
<td>3.12</td>
<td>2.34</td>
<td>0.87</td>
<td>-0.15</td>
<td>-0.84</td>
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To ensure printer accuracy, confirm that the calibration markers are 10mm high and the grid squares are 5mm wide.
ECG Received on Blackberry
Pre-Hospital ECG

- Has the potential to reduce time to reperfusion.
- Endorsed by:
  - National Heart Attack Alert Program
  - American Heart Association
  - American College of Cardiology
- 27.4% receive a pre-hospital ECG (5% from NRMI-4 in 2002)

Diercks, et al. JACC 2009
TL, continued

- 13:56: Code STEMI called
- 14:05: Arrive in ER
  - Prepped in ER
- 14:15: Arrive in Cath Lab
- 14:35: Balloon inflated

- D2B: 30 minutes
Essentials to D2B

- Protocols
- Teamwork
- Accountability
- Measurement
- Rapid Cycle Improvement Processes
Obtain EKG
Immediate review by ED attending

Definite STEMI
Anginal Chest pain, ST elevation,
Patient agreeable to cath
ACTIVATE “CODE STEMI”
FCO: 75433

ASA 325 mg PO Morphine, Nitrates as indicated
Metoprolol 5mg IV x3 / Metoprolol 25-50mg PO as tolerated
Heparin bolus 60 u/kg (max 4000u) then 12 u/kg/hr
(max 1000u/hr) unless contraindicated

Start Eptifibatide 180 mcg/kg bolus
followed by infusion at 2mcg/kg/min
Discuss with Cardiology attending about 600 mg PO Plavix

8 am-5 pm Mon-Fri
Activate “CODE STEMI”
CCU attending/fellow to call back/evaluate in ED
7-6644

Prepare patient for cath lab
Appropriate IV access and hospital gown

5 pm-8 am and weekends and Holidays
Activate “CODE STEMI”
Interventionalist to call ED attending
Cath team to call ED charge nurse

Cath lab to call 7-6661 Transport to Cath Lab With Defib Monitor
Life Flight Command

- One call to Life Flight Command activates Code STEMI protocol with all physicians/nurses/techs involved.
ER Responsibilities (If admitted there)

- Assure IV
- Assure blood drawn
- Patient in gown, pants removed
- Shave groin with electric razor
- Mark DP pulse area
- Administer drug therapy
  - Aspirin and nitroglycerin if not already given
  - Beta blocker, anticoagulants/antiplatelets
ER Bypass

- Portal for entry for EMS is ER.
- May bypass ER check-in if:
  - M-F, 8 AM to 5 PM.
  - ECG is definite STEMI (ECG pre-reviewed)
  - Catheterization Lab is available
What’s worse than a D2B of 60 minutes?

Arriving with a patient to find a dark, empty cardiac cath lab.
EMS Role

- No longer does the STEMI team include only members of a particular hospital.
- EMS has become an integral member of the STEMI team.
  - Defined roles
  - Invited educational conferences
  - Feedback
  - Enjoying success
False Positive STEMI Activation

- 1335 patients with STEMI activation from 30 community/rural centers in MN.
  - 187 (14%) had no culprit artery
  - 127 (11.2%) had no significant CAD
    - 48 of these had positive biomarkers
  - 1.8% in retrospect did not have a diagnostic ECG
- No differences were observed between high and low volume ERs. Larson, et al. JAMA 2007
EMS activation decreases D2B

- Single Center: Univ of Utah
  - 23 EMS activations
  - 33 ED activations

EMS activation needs to be supplemented with diagnostic support
Accountability

- We measure components of D2B and assign accountability to them.
  - Door To ECG Time

- The STEMI QI Committee meets regularly to review D2B, D2B components, outcomes and cardiac cath results
  - ER
  - Cardiology
  - EMS
Characteristics of Hospitals with short D2B

- Activation of the catheterization laboratory using ER physicians rather than cardiologists
- Pre-hospital electrocardiograms
- Performance data monitoring/feedback.
- Single-call system for activating the cath lab
- Cath team available 20-30 min after page
- Organizational environment with strong senior management support
- Culture to foster changes directed at improving door-to-balloon time

Conclusions

- Reducing D2B requires:
  - Teamwork, including EMS, ED, Cath Lab Team
  - Protocols
  - Assigned duties
  - Data review
  - Commitment to change
  - Rapid Cycle Improvement