TIME IS MUSCLE!

Pit Crew Approach to Chest Pain

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Eagles 2012
No Disclosures

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The complex task we’re talking about is the prehospital management of chest pain, a condition we all recognize as time dependant and a common performance metric for most of our systems.
Lets discuss things we would all agree with:
ACS patients must be approached aggressively if we are in fact going to recognize those that have time dependant conditions such as STEMI. These patients require specific evaluation (ie ECG) and disposition to the right receiving center.
AHA ~ 8 studies

Early prehospital EKG demonstrated a reduction in reperfusion delay ranging from 15 to 65 minutes in patients treated with PCI 2 studies

Comparison of all cause in hospital mortality of patients with STEMI and prehospital EKG vs NO prehospital EKG

Reduction of in hospital mortality from 11-15% to 5-8% with prehospital EKG

Not statistically significant but overall trend to reduction

Evidence for improved outcome in patients with recognized STEMI diverted to primary PCI centers
• Delays in treatment of ACS are not uncommon:
  – Patient Factors
    • Older age
    • Racial/Ethnic minorities
    • Females
    • Lower socioeconomic status
    • Solitary living arrangements
  – EMS may contribute to delays
EMS-to-balloon (E2B)

In some locations, a prehospital 12 lead ECG may be transmitted to the emergency department with the use of a Bluetooth capable cardiac monitor and cell phone.

Although incorporating a prehospital 12 lead ECG into critical pathways for STEMI patients is listed as an optional strategy by the D2B Alliance, the fastest median door-to-balloon times have been achieved by hospitals with paramedics who perform 12 lead ECGs in the field. EMS can play a key role in reducing the first-medical-contact-to-balloon time, sometimes referred to as EMS-to-balloon (E2B) time, by performing a 12 lead ECG in the field and using this information to triage the patient to the most appropriate medical facility.

Depending on how the prehospital 12 lead ECG program is structured, the 12 lead ECG can be transmitted to the receiving hospital for physician interpretation, interpreted on-site by appropriately trained paramedics, or interpreted on-site by paramedics with the help of computerized interpretive algorithms. Some EMS systems utilize a combination of all three methods. Prior notification of an in-bound STEMI patient enables time saving decisions to be made prior to the patient's arrival. This may include a "cardiac alert" or "STEMI alert" that calls in off duty personnel in areas where the cardiac cath lab is not staffed 24 hours a day. The 30-30-30 rule takes the goal of achieving a 90 minute door-to-balloon time and divides it into three equal time segments. Each STEMI care provider (EMS, the emergency department, and the cardiac cath lab) has 30 minutes to complete its assigned tasks and seamlessly "hand off" the STEMI patient to the next provider. In some locations, the emergency department may be bypassed altogether.
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Auto-racing "pit crews" accomplish task "precisely" and rapidly by pre-assigning roles to team members.

- Cardiac Arrest
- Trauma
- Extrication
- Tactical Teams

Image of an empty basket or plate: here is the stack of literature showing the health care consequences of being a healthcare worker

Comment on influenza, biological agents (anthrax, etc.)
Study Design - This study is a randomized control trial comparing time to task of certain critical endpoints in the pre-hospital setting by EMS personnel using the currently accepted EMS approach featuring the Orange County EMS chest pain algorithm vs. a pre-assigned team-oriented algorithm in simulation patients with chest pain. This study will feature EMT, Paramedic, and EMT/Paramedic student volunteers.
Slide represents the general concept of EMS responsibilities in patients with CP. The saying “Time is Tissue” is a core concept, therefore time-to-tasks of various events are pivotal.
AMI – Anterolateral.

Anterolateral AMI
**End Points:**
- Time to ECG
- Time to ASA
- Time to ECG Interpretation
- Time to establish IV
- Time to STEMI notification
- Scene complete

**DAY 1**
- Entire Group
- Orientation and Didactic: Approach to Chest Pain
- Randomization

**DAY 2**
- Group A – Control
  - Review of OCEMS chest pain protocol
  - Simulation-based assessment

- Group B – Test
  - Review of OCEMS chest pain protocol & assignment of tasks and positions
  - Simulation-based assessment
<table>
<thead>
<tr>
<th>Step</th>
<th>Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Turn on EKG Machine</td>
<td>≤ 1 min</td>
</tr>
<tr>
<td>2. Approach patient’s left</td>
<td>≤ 2 min</td>
</tr>
<tr>
<td>3. Undress patient’s chest</td>
<td>≤ 3 min</td>
</tr>
<tr>
<td>4. Attach lead stickers</td>
<td>≤ 4 min</td>
</tr>
<tr>
<td>5. Attach leads</td>
<td></td>
</tr>
<tr>
<td>6. Acquire EKG</td>
<td></td>
</tr>
<tr>
<td>7. Analyze EKG</td>
<td></td>
</tr>
<tr>
<td>8. Call STEMI Alert if needed</td>
<td>≤ 8 min</td>
</tr>
<tr>
<td>9. Prepare transport to nearest PCI facility or nearest receiving facility</td>
<td></td>
</tr>
</tbody>
</table>

**STEMI Criteria:**
- ST segment elevation ≥ 1 mm in 2 or more contiguous leads (QW)
- New or presumably new left Bundle Branch Block (LBBB)  

**Total Scene Time Goal:** ≤ 10 min
Position TWO

1. Identify patient
2. Obtain history of chest pain
3. Perform vectored physical exam
4. Ask if ASA has been taken:
   a. Yes – go to #5
   b. No – administer ASA if no evidence of active bleeding
5. Assess current chest pain scale
   a. No pain – go to #6
   b. Any pain – administer nitroglycerin if not contraindicated
6. Re-evaluate chest pain scale in 5 min
7. Repeat #5 – #6 as needed

Nitroglycerin Contraindications (any of the following):
- Systolic BP < 90 mm Hg
- Viagra (Sildenafil) or Levitra (Vardenafil) use within past 24 hrs
- Cialis (Tadalafil) use within past 48 hrs

Goals
- ≤ 3 min
- ≤ 4 min
- ≤ 5 min

Total Scene Time Goal ≤ 10 min
1. Approach patient’s right
2. Obtain patient’s vitals
3. Establish IV access
4. Provide IV fluids if not contraindicated
    - If systolic BP < 90 mm Hg → administer 250 ml bolus of 0.9% NaCl until systolic BP > 90 mm Hg
5. Attach supplemental oxygen
6. Monitor patient’s vitals

**IV Fluid Contraindication:**
- Evidence of Congestive Heart Failure (CHF), ex: edema

**Goals**
- ≤ 2 min
- ≤ 4 min
- ≤ 6 min
- ≤ 8 min

**Total Scene Time Goal**
= 10 min
Mean Time to Completion: Aspirin Administration

Control: 3.9 min  
Intervention: 2 min  
P = <0.001
Vital Sign Acquisition

Control | Intervention

4.3 min | 2.4 min

P = 0.001
ECG Acquisition

Control  |  Intervention

5.7 min  |  3.7 min

P = <0.001
The chart shows the time it took to establish intravenous (IV) access with and without an intervention. The average time for the control group was 5.7 minutes, and the average time for the intervention group was 4.8 minutes. The statistical significance is indicated by P=0.05.
ECG Interpretation

Control | Intervention

6.7 min | 4.4 min

P = <0.001
STEMI Alert Recognition

- Control: 7.3 min
- Intervention: 4.4 min

P = <0.001
Scene Complete

Control

Intervention

9 min

5.5 min

P=<0.001
Utilization of Team Assignment Training in Simulated Pre-hospital Chest Pain Patients

- Paramedic teams with pre-assigned roles ("pit crew" model):
  - Faster to obtain vital signs
  - Administer ASA
  - Acquire and interpret the 12 lead EKG
  - Recognize STEMI criteria:
    - ED notification, transmission, etc.
    - Rapid transport

- Further study necessary to confirm the relevance of these findings.
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