Implementing a Prehospital 12-Lead Program

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I have no conflicts of interest, financial arrangements, investments, patents or ownership in anything that I will be discussing.
Goals of Treatment of AMI

• **Eliminate Ischemia**
  – Minimize O\textsubscript{2} demand
  – Maximize O\textsubscript{2} delivery

• **Minimize Size of Infarct**
  – Reperfuse rapidly
  – Maximize TIMI-3 flow

• **Avoid complications**
  – prevent reocclusion
Treatment of ACS for 2007

- ASA, Clopidogrel, 2b-3a
- NTG
- Beta Blocker
- Lytic and/or Lab
- Anticoagulation
Time = Muscle
Pain = Ischemia
Shock = Volume
D$_2$B Alliance Goal

75% of all STEMI patients will receive PCI within 90 minutes of contact with first health care provider.
6 Strategies Significantly Reduced Door to Balloon Time

- EM MDs activating Cath Lab
- Single call for activation
- Attending Cardiologist in-House
- Cath Lab ready within 20 minutes
- Real time feedback
- EMS 12 leads ECGs for pre-arrival activation
Strategies for Reducing the Door-to-Balloon Time in Acute Myocardial Infarction


EMS 12 Leads Allowing Activation

- Rarely Causes False Alarms
- Saves at least 15.4 minutes
- Is second most effective practice change
Should you Implement a Prehospital ECG Program?
If the 12-lead ECG shows evidence of acute injury or ischemia, it is reasonable that prehospital ACLS providers relay the ECG to a predetermined medical control facility and/or receiving hospital.

(Level of Evidence: B)
The Opening Gambit

- O₂
- O₂ Sat
- IV Access
- ECG Monitor
- 12 Lead ECG
Pre-Hospital Synthesized 12-Lead ECG Ischemia Monitoring With Trans-Telephonic Transmission in Acute Coronary Syndromes

Pilot Study Results of the ST SMART Trial

- Prehospital 12 leads sent to hospital via telephone in 192 pts.
- Also used continuous ST trend monitors via Lifepak 12
- Increased on scene time by 1.84 minutes
- 26% of patients had ischemia by ECG in the field that was not present on arrival to the ED
The prehospital 12-lead electrocardiogram’s effect on time to initiation of reperfusion therapy: a systematic review and meta-analysis of existing literature

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- Meta-analysis of 4 studies 1990-1994
- Only 99 total patients
- Decreased therapy by approximately 25 minutes (16.7-32.7)
SPECIAL CONTRIBUTIONS

Prehospital 12-lead Electrocardiography Impact on Acute Myocardial Infarction Treatment Times and Mortality: A Systematic Review

Laurie J. Morrison, MD, FRCPC, MSc, Steven Brooks, MD, Bruce Sawadsky, MD, CCFP-EM, Andrew MacDonald, MD, FRCPC, MHSce, P. Richard Verbeek, MD, FRCPC

Abstract

Objectives: Prehospital 12-lead electrocardiogram (PHECG) interpretation and advance emergency department (ED) notification may improve time-to-treatment intervals for a variety of treatment strategies to improve outcome in acute myocardial infarction. Despite consensus guidelines recommending this intervention, few emergency medical services (EMS) employ this. The authors systematically reviewed the literature to report whether mortality or treatment time intervals improved when compared with

- 5 Studies evaluated (done 1990-1997)
- Prehospital ECGs added only 1.19 minutes
- Only one study looked at mortality
- Door to Needle Time ? by up to 36.1 minutes
  - (22-48 minutes vs. 50-97 minutes)
- Prehospital ECGs ? mortality by
  - (8.4% vs. 15.6%; p = NS)
One ECG Begets Another
Are These Hyper-Acute T Waves?
Evolutionary Change 1 vs. Change 2
PREHOSPITAL 12-LEAD ECG: EFFICACY OR EFFECTIVENESS?

Robert Swor, DO, Stacey Hegerberg, RN, Ann McHugh-McNally, Mark Goldstein, RN, EMT-P, Christine C. McEachin, RN, EMT-P

ABSTRACT

Introduction. Previous literature has documented that prehospital 12-lead electrocardiography (ECG) decreases the time to reperfusion in patients with an acute ST-segment elevation myocardial infarction (STEMI). Objective. To compare time to ECG, time to angioplasty suite (laboratory), and time to reperfusion in emergency medical services (EMS) those who received EMS transport alone. Conclusions. A minority of patients with EMS ECGs had prearrival AMI team activation. EMS ECGs combined with systems that activate hospital resources, but not EMS ECGs alone, decrease time to laboratory and reperfusion. Key words: emergency medical services; acute myocardial infarction; reperfusion; ECG.

PREHOSPITAL EMERGENCY CARE 2006;10:374–377

• 164 STEMIs transported by EMS
• 56.7% had Prehospital 12 leads
• 31/164 had ACS Team Activation pre-arrival
Door to Balloon Time < 90 min.

Prehosp Emerg Care 2006;10:374-377
Coronary Heart Disease

Implementation of Guidelines Improves the Standard of Care

The Viennese Registry on Reperfusion Strategies in ST-Elevation Myocardial Infarction (Vienna STEMI Registry)

Karim Kalla, MD; Günter Christ, MD; Ronald Karnik, MD; Reinhard Malzer, MD; Georg Norman, MD; Herbert Prachar, MD; Wolfgang Schreiber, MD; Gerhard Unger, MD; Helmut D. Glogar, MD; Alfred Kaff, MD; Anton N. Laggner, MD; Gerald Maurer, MD; Johannes Mlczoch, MD; Joerg Slany, MD; Heinrich S. Weber, MD; Kurt Huber, MD; for the Vienna STEMI Registry Group

- EMS coordinated with 5 Heart Hospitals
- Rotated 24 hr PCI availability
- Evaluated frequency of PCI and Lytics
- Evaluated Mortality
Heart Hospitals

Reperfusion Therapy

Mortality

Circulation 2006;113:2398-2405
Comparison of Early Mortality of Paramedic-Diagnosed ST-Segment Elevation Myocardial Infarction With Immediate Transport to a Designated Primary Percutaneous Coronary Intervention Center to That of Similar Patients Transported to the Nearest Hospital

Michel R. Le May, MDa,*, Richard F. Davies, MDa, Richard Dionne, MD, Justin Maloney, MD, John Trickett, RNb, Derek So, MDa, Andrew Ha, MDa, Heather Sherrard, RNa, Chris Glover, MDa, Jean-François Marquis, MDa, Edward R. O’Brien, MDa, Ian G. Stiell, MDb, Pierre Poirier, ACPc, and Marino Labinaz, MDa

• Does EMS Diversion to PCI Centers Affect Outcome
• EMS Bypass of Nearest but Non-PCI Hospitals
• 108 Consecutive patients vs. 225 Historic Controls
• 93.5% PCI in study vs. 8.9% Historic
• 63 min. vs. 125 min. D₂B vs. 41 min. D₂L
In-Hospital Mortality from STEMI

Mortality (%)

Paramedic Diverted for PCI

- 2 Hospitals
  - 1.9%

Historic Controls

- 20 Hospitals
  - 8.9%

p = 0.017
Can Highly Trained Paramedics Read 12 Lead ECGs Accurately?

Real-time paramedic compared with blinded physician identification of ST-segment elevation myocardial infarction: results of an observational study

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ACCURACY

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<tr>
<th>Paramedic</th>
<th>ER MD</th>
<th>Cardiologist</th>
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<td>94%</td>
<td>93%</td>
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Paramedics were highly accurate; But did not diagnose 5 of 25 AMIs
Editorial

Reducing the door to balloon time: Is bypassing the emergency department really the answer?

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Bypassing the ED saves 8-27 minutes

but

• Never been done in large U.S. study
• Usually done with MDs in mobile ICU
• Not applicable to unstable patients
• Not applicable if diagnosis uncertain
• Will increase false activation

If it’s not a STEMI, may increase morbidity and mortality
Prehospital ECG’s

- Adds only 1-2 minutes to in-field time
- ECGs High quality equal to hospitals
- Increases early diagnosis of AMI

Make the paramedic a truly essential part of ACS team
Reperfusion Therapy Starts in the Ambulance

Freek W.A. Verheugt, MD

Reperfusion therapy for ST-elevation acute coronary syndromes aims at early and complete recanalization of the infarct-related artery in order to salvage myocardium and improve both early and late clinical outcomes. The benefit rises exponentially the earlier therapy is initiated. The highest number of lives saved is within the first hour after symptom onset: the “golden hour.” The exponential form of effect is particularly striking. Patients transported to an on-call “door to balloon” PCI center within 2 hours have better outcomes than patients from other centers transported within the same time frame. Patients transported to an on-call PCI center within 90 minutes have better outcomes than patients transported within 2 hours. Patients transported to an on-call PCI center within 15 minutes of symptom onset have the best outcomes, and their outcome is better than patients transported to the hospital in the first 5 minutes. Patients transported to the hospital in the first 5 minutes have better outcomes than patients transported in the first 5 minutes to the hospital in the first hour. This highlights the importance of rapid mobilization of resources to achieve timely care.

EMS must be STEMI ready
• Rapid response to CP patients
• O₂, ASA, NTG, 12 Lead ECG, Prehospital Alert
• Rapid Transport to Heart Hospital
• Time to Reconsider:
  – Pre-hospital lytics, Beta Blockers, Plavix, Heparin

Circulation 2006;113:2377-2379
ALL High Quality EMS Systems Will:

• Do 12 Lead ECGs
• Transmit the ECG
• Provide Pre-Hospital Alerts
EMS has a New Central Role:

Prehospital Triage of Chest Pain Patients
There is no reason not to perform prehospital 12-lead ECGs...unless less than 5 minutes from hospital