Clinical question.
In patients with ST-elevation identified on out-of-hospital ECG, does the use of direct transport to primary PCI improve outcomes as compared with other standard strategies?

Is this question addressing an intervention/therapy, prognosis or diagnosis? Intervention
State if this is a proposed new topic or revision of existing worksheet: ACS-027A update

Conflict of interest specific to this question
Do any of the authors listed above have conflict of interest disclosures relevant to this worksheet? No

Potential intellectual conflicts:
State-wide Cardiac Services Committee for institution of an Integrated Reperfusion Strategy in Qld

Search strategy (including electronic databases searched).

Search strategy
Cochrane Collaboration search strategy for pre hospital studies:
Key Mesh terms: myocardial infarction, emergency medical services, angioplasty
50-60 key words
Databases searched all dates - march 2009
Cochrane Central/DSR -45 hits
Medline 362 hits
Embase 382 hits
AHA endnote data base -27 hits

Medline
Angioplasty AND STEMI
673 hits

Medline to Sep 2009
1. exp Myocardial Infarction/
2. exp Emergency Medical Services/
3. exp Physicians, Family/
4. "general practi*".mp. [mp=title, original title, abstract, name of substance word, subject heading word]
5. 4 or 3
6. 2 or 5
7. 6 and 1
8. ("st-elevation" or stemi).mp. [mp=title, original title, abstract, name of substance word, subject heading word]
9. 8 and 7
10. transport.mp. [mp=title, original title, abstract, name of substance word, subject heading word]
11. 10 and 9
12. limit 9 to (english language and (case reports or classical article or clinical trial, all or comparative study or "corrected and republished article" or evaluation studies or guideline or journal article or meta analysis or multicenter study or practice guideline or randomized controlled trial or "review" or "scientific integrity review"))
13. limit 12 to yr="1999 - 2009"
14. exp Treatment Outcome/
15. 13 and 14
16. 13 and 10
17. 16 or 15
18. 13 not 17

AHA Focused STEMI Update 2007
ESC Guidelines for AMI 2008
Cross referenced.

2 further studies identified over previous search from S Brooks. (Co author)
• State inclusion and exclusion criteria

Inclusion criteria:
STEMI with pain<12 hours diagnosed by EMS
Intervention group with direct transport to “Cardiac Catheter Lab Capable center” p PCI

Exclusion criteria:
Abstract –only, diagnosis by n on EMS personnel, narrative reviews, commentaries, editorials, case reports.

• Number of articles/sources meeting criteria for further review:

Total 16 Articles finally evaluated:
From C2005: (2) LOE1, (5) LOE 5 =7 previously reviewed studies
From C2010: (1) LOE1, (2) LOE2, (1) LOE3, (1) LOE 4, (4) LOE 5 =9 new studies identified.
## Summary of evidence

### Evidence Supporting Clinical Question

<table>
<thead>
<tr>
<th>Level of evidence</th>
<th>Good</th>
<th>Fair</th>
<th>Poor</th>
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<th>Fair Evidence</th>
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<td>LeMay, 2006, 1329 DKM</td>
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<td>LeMay, 2008, 231 K</td>
<td>Clemmensen, 2005,198 K</td>
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<td>Stenestrand, 2006,1749</td>
<td>Wang, 2009,233</td>
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<td>DeVilliers, 2007,1833 CEK</td>
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### Evidence Neutral to the Clinical Question

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<td>Steg, 2003, 2851 GE</td>
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<td>Fair</td>
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<td>Grines, 2002, 1713 GE</td>
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<td>Terkelsen, 2005, 770 DKLF</td>
<td>Van de Loo, 2006, 112 CEF</td>
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#### Level of evidence

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### Evidence Opposing Clinical Question

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<tr>
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#### Level of evidence
REVIEWER’S FINAL COMMENTS AND ASSESSMENT OF BENEFIT / RISK:

There are a number of issues that should be highlighted in reviewing this area. The terms and definition of the terms is variable between studies. There is also significant heterogeneity in trial design which makes comparison of trial difficult. The studies are also confounded by different pharmacotherapy regimes and unfortunately there are a number of studies that are underpowered and/or incomplete.

Extrapolations of averages and medians

Fibrinolysis Vs PCI
Symptom onset to treatment time is critical
< 60 mins favors Fibrinolysis
<120 mins favors Fibrinolysis
>120 minutes favors PCI.

Pre hospital diagnosis shortens time to reperfusion therapy.
Need to identify the point at which the additional delay required to provide primary PCI compared to immediate fibrinolysis incurs an incremental risk that outweighs the mortality benefit otherwise provided by primary PCI. This needs individualised and contextualised.

The Current AHA recommendations are as follows:
If EMS has fibrinolytic capability and the patient qualifies for therapy, prehospital fibrinolysis should be started within 30 minutes of arrival of EMS on the scene.
• If EMS is not capable of administering prehospital fibrinolysis and the patient is transported to a non–PCI-capable hospital, the doorto-needle time should be within 30 minutes for patients for whom fibrinolysis is indicated.
• If EMS is not capable of administering prehospital fibrinolysis and the patient is transported to a PCI-capable hospital, the EMS arrival-to-balloon time should be within 90 minutes.
• If EMS takes the patient to a non–PCI-capable hospital, it is appropriate to consider emergency interhospital transfer of the patient to a PCI-capable hospital for mechanical revascularization if there is a contraindication to fibrinolysis.
  Fibrinolysis can be initiated promptly within 90 minutes from EMS arrival-to-balloon time at the PCI-capable hospital.†
  Fibrinolysis is administered and is unsuccessful (i.e., “rescue PCI”).
This is different from the ESC recommendations from 2008 in the following area:
Time from FMC to balloon <2 hr in any case
<90 mins if presenting early (<2 hrs) with a large infarct and low bleeding risk

One LOE 3 [LeMay, 2006, 1329.] study in a metropolitan setting with transport times less than 30 minutes, and 1 decision analysis (LOE 5) [Wang, 2009, 233], suggests that transportation of STEMI patients diagnosed by paramedics directly to PCI centres for pPCI as part of a coordinated regional response to STEMI found a reduction in-hospital mortality when compared with a strategy of transportation to the closest hospital for fibrinolysis.
A single study (LOE 1) [Bonnefoy, 2002,825] with insufficient power and 2 post-hoc subgroup analyses of the same study (LOE 1) [Bonnefoy, 2005,1712 Steg, 2003,2851] failed to show that a strategy of prehospital diagnosis and direct transportation to pPCI was any better than prehospital fibrinolysis in patients with STEMI in systems involving the presence of physicians in mobile intensive care units. Extrapolations from 11 RCTs and 2 meta analysis (LOE 5) on interfacility transfer (LOE 1) which demonstrate benefit with interhospital transfer for pPCI compared with ED fibrinolysis in patients with STEMI diagnosed in the ED, provide rationale for considering a strategy of direct transportation to p PCI for patients diagnosed by EMS in the pre hospital setting. There are ten other non randomized studies included in the analysis (LOE 3 and LOE 5 ) showing benefits to pre hospital diagnosis over hospital based diagnosis and pPCI over thrombolysis. Refer to WS 26.
The most significant magnitude of benefit is seen in the reduction in re infarction and stroke (compared to mortality) in patients undergoing pPCI. There is limited evidence to determine the optimal strategy for STEMI patients identified by EMS in the prehospital setting.
Pre hospital diagnosis should be encouraged to allow earlier reperfusion therapy (thrombolysis or pPCI).
For patients diagnosed with STEMI by EMS in the prehospital setting it is reasonable to consider direct transport to PCI facilities for primary PCI, bypassing closer emergency departments as necessary in systems where time intervals between first medical contact and balloon time are less than 90 minutes. This will typically involve a planned integrated response from regional EMS, emergency medicine and interventional cardiology to achieve timely intervention.
Patient, geographic, emergency medical system and hospital characteristics need to be considered in determining the optimal reperfusion strategy for any given STEMI patient identified by EMS.
There are still significant resource issues encountered in most nations worldwide that limit the ability to implement catheter-based reperfusion therapy. Current evidence supports the use of one or other strategy in certain situations depending on various patient-related and logistical factors. An integrated approach to developing a strategic approach to reperfusion in STEMI patients will need to include both mechanical and pharmacological interventions. They are not mutually exclusive.

Knowledge Gaps include:
- Pre-hospital fibrinolysis versus direct transport for primary PCI?
- What is the optimal strategy for the "early presenter" (<2 hours from symptom onset)
- What is the optimal strategy out of hours and week ends?
- What is the maximum transport delay that should be allowed before immediate fibrinolysis is considered over direct transportation to pPCI?
- Delays that develop during transport: when to change strategy?
- What is the optimal strategy beyond 6 hr and 8 hr?
- NSTEMI pt?
- Chest pain with suspicion of STEMI?
- LBBB management?

Acknowledgements

The worksheet is a consensus document of the two worksheet authors.

Citation List


Good; LOE5; Neutral

Good; LOE5; Neutral

Good; LOE4; Opposing

Good; LOE3; Supportive

Good; LOE3; Supportive

Good; LOE5; Supportive

Good; LOE5; Supportive

Good; LOE5; Supportive

Good; LOE1; Neutral

Good; LOE3; Supportive

Good; LOE5; Neutral

Poor; LOE2; Neutral

Good; LOE5; Neutral

Good; LOE5; Supportive
van de Loo, A., B. Saurbier, et al. (2006). "Primary percutaneous coronary intervention in acute myocardial infarction: direct transportation to catheterization laboratory by emergency teams reduces door-to-balloon time." Clin Cardiol 29(3): 112-6. Poor;LOE2;Neutral


Widimsky, P., D. Bilkova, et al. (2007). "Long-term outcomes of patients with acute myocardial infarction presenting to hospitals without catheterization laboratory and randomized to immediate thrombolysis or interhospital transport for primary percutaneous coronary intervention. Five years' follow-up of the PRAGUE-2 Trial." Eur Heart J 28(6): 679-84. Good;LOE5;Supportive
