Pre-hospital management of acute myocardial infarction (AMI): strategies to improve diagnosis and allow for early reperfusion

Most deaths resulting from acute myocardial infarction (AMI) occur within an hour of its onset, with half occurring before hospital admission.[1] An effective pre-hospital management system is therefore an important priority, a fact recognized in management guidelines from the European Society of Cardiology and the American Heart Association (AHA).[2, 3] In particular, acute-phase AMI patients require rapid diagnosis and early reperfusion to minimize infarct size and prevent complications.

One of the key questions in pre-hospital management of AMI is how best to reduce time-to-treatment? Is it better to use a single emergency number that allows rapid transfer of the patient to the hospital, i.e. centralization, or to use emergency providers that diagnose and treat in the community, i.e. decentralization? Increasing evidence supports a strategy of early diagnosis based on pre-hospital assessments in the ambulance. Two recently reported registry studies suggest that early diagnosis based on pre-hospital assessment gives a more favourable clinical outcome as patients can be referred directly to a hospital that performs percutaneous coronary intervention (PCI).[4, 5] In line with this, the use of pre-hospital 12-lead ECG programmes by emergency medical services (EMS) may improve systems of care. The AHA issued a statement in 2008 recommending the acquisition and use of pre-hospital ECGs for the evaluation of patients with suspected acute coronary syndrome.[6] In particular, a pre-hospital ECG may permit earlier administration of thrombolytic therapy if this reperfusion strategy is indicated (i.e. if primary PCI cannot be performed within two hours following first medical contact). Data from meta-analyses have shown that pre-hospital thrombolysis is significantly superior to in-hospital thrombolysis in terms of all-cause hospital mortality and time to thrombolysis, particularly if patients are treated within the first two hours following the onset of pain.[7, 8] Systems of care that have incorporated pre-hospital ECGs into a city-wide or region-wide strategy have demonstrated a significant reduction in door-to-balloon times and in-hospital mortality, usually by triaging patients in the pre-hospital setting, bypassing non-PCI-capable hospitals, and transporting patients directly to a designated centre capable of providing primary PCI when needed.[9-11]

In reality, given the differences in the distances between medical centres and availability of PCI at these centres, across various regions and countries, a single model for pre-hospital management of AMI is unlikely to be effective. One of the key questions for generating country- and region-specific models should be whether a primary PCI can be performed within the two hour time goal. A well-functioning regional system of care based on pre-hospital diagnosis and triage, and fast transport to the most appropriate facility is key to treatment success. The use of standardized regional AMI treatment protocol programmes may help optimize pre-hospital management of AMI patients. In the Netherlands, recent findings from the guideline-based care programme, MISSION! showed optimal and uniformly distributed pre-hospital performance resulting in minimal time delays regardless of the area of residence.[12] While the distance can delay patients' arrival in hospital, the MISSION! protocol counterbalanced this by minimizing their time to reperfusion once admitted.[12] Collaborative efforts among cardiologists, emergency department physicians, and EMS personnel are vital to achieving improved outcomes.

REFERENCES:
1. Yasuda S, Shimokawa H. Acute myocardial infarction: the enduring challenge for cardiac protection and survival. *Circ J* 2009;73(11):2000-8.
2. Van de Werf F, et al. Management of acute myocardial infarction in patients presenting with persistent ST-segment elevation. *Eur Heart J* 2008;29(23):2909-45.
3. Antman E, et al. 2007 Focused Update of the ACC/AHA 2004 Guidelines for the Management of Patients With ST-Elevation Myocardial Infarction: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. *Circulation* 2008;117(6):e162.
4. Postma S, et al. Prehospital triage in the ambulance reduces infarct size and improves clinical outcome. *Am Heart J* 2011;161(2):276-82.
5. Terklesen C, et al. Primary percutaneous coronary intervention as a national reperfusion strategy in patients with ST-elevation myocardial infarction: eleven years of experience from the Western Denmark Heart Registry. European Society of Cardiology meeting 2011.
6. Ting H, et al. Implementation and integration of prehospital ECGs into systems of care for acute coronary syndrome. *Circulation* 2008;118(10):1066-79.
7. Morrison L, et al. Mortality and prehospital thrombolysis for acute myocardial infarction: A meta-analysis. *JAMA* 2000;283(20):2686-92.
8. Boersma E, et al. Early thrombolytic treatment in acute myocardial infarction: reappraisal of the golden hour. *Lancet* 1996;348(9030):771-5.
9. Le May M, et al. A citywide protocol for primary PCI in ST-segment elevation myocardial infarction. *New Engl J Med* 2008;358(3):231-40.
10. Rokos I, et al. Integration of pre-hospital electrocardiograms and ST-elevation myocardial infarction receiving center (SRC) networks: impact on Door-to-Balloon times across 10 independent regions. *JACC Cardiovasc Interv* 2009;2(4):339-46.
11. TP M, et al. Impact of pre-hospital care in patients with acute myocardial infarction compared with those first managed in-hospital. *Eur Heart J* 2003;24(2):161-71.
12. Atary J, et al. Standardised pre-hospital care of acute myocardial infarction patients: MISSION! guidelines applied in practice. *Neth Heart J* 2010;18(9):408-15.