SHORT REPORT

A quality control programme for acute myocardial infarction management in out-of-hospital critical care medicine

Francois-Xavier Duchateau, M L Devaud, A Burnod, J Mantz, A Ricard-Hibon

Emerg Med J 2007;24:487–488. doi: 10.1136/emj.2007.046888

This study, conducted over two time periods, aimed to evaluate the effectiveness of the diffusion of data, implementation of correctives measures and updated protocols in reducing time to reperfusion in acute myocardial infarction (AMI) management in the out-of-hospital setting. Mean (SD) time to hospital admission and to arterial puncture improved (58 (13) vs 67 (18) min, $p=0.03$; and 82 (16) vs 95 (29) min, $p=0.02$). The study, performed according to quality control programme methodology, showed that the chronology of AMI management could be improved by appropriate interventions and monitoring of intervention times.

The reduction of early and long-term mortality of patients with acute myocardial infarction (AMI) is related to the time to reperfusion.^{1,2} Percutaneous coronary intervention has become the preferred approach for treating ST elevation AMI,^{3,4} and the time to balloon has become a challenge for all care providers involved in the pathway of patients presenting with AMI.^{5,6} The French emergency medical services (EMS) system is based on mobile intensive care units (MICU) with emergency physicians on board the ambulance, who provide on-scene diagnosis of AMI and start reperfusion treatments.⁷ To improve the pre-hospital management of AMI, a regional registry was implemented in the Paris area. The aim of this study is to evaluate the efficiency of the registry in improving AMI management, as part of a quality control programme.

METHODS

The e-Must Registry is a prospective, descriptive study, which was conducted in our EMS department, covering an area of 290 172 inhabitants during two, 1 year periods. Inclusion criteria were the presence of typical chest pain and an electrocardiogram (ECG) with ST elevation in two contiguous leads or new left bundle branch blockade. Reperfusion strategy was defined as the first treatment chosen to restore coronary reflow: pre-hospital thrombolysis or primary angioplasty, up to the physician's discretion during the first 3 h and always primary angioplasty after 3 h. Data were collected on demographic characteristics, AMI location, possible complications, and reperfusion strategy. The different time intervals were recorded. The data collected during the year 2002 were analysed and the results were passed to all physicians and paramedics during a formal session, but also using an electronic mailing list.

Corrective strategies were defined as: systematic admission to the catheterisation laboratory; early request for catheterisation laboratory to avoid waiting for destination; early activation of catheterisation laboratory to ensure that the interventional cardiologist is ready when the patient arrives; choice of destinations in favour of the nearest catheterisation laboratory. A workgroup has been sorted out among the staff to work out on updated protocols in accordance with the cardiologists of

our hospital and according to recent guidelines.⁸ These protocols were explained to all the teams and repeated training sessions and implemented. During these training sessions, the importance of early reperfusion in reducing myocardium damage was emphasised, and explained by simple messages such as "time saves muscle" or "golden hour".

Throughout 2004, a new audit was carried out to evaluate the efficiency of interventions on delay to reperfusion. Entry criteria and methods remained strictly the same. The primary aim of the study was to compare the evolution of time intervals between the two periods. Results are reported as mean (SD) for continuous variables. Qualitative data are expressed as the percentage of patients. Statistical analysis was performed using a one-way analysis of variance (ANOVA) for quantitative data and a χ^2 test for qualitative data. Significance was defined as $p<0.05$.

RESULTS

Ninety-eight patients were included: 56 patients during the first period and 42 patients during the second period. All the patients presenting inclusion criteria were enrolled. Characteristics of patients were similar in both groups (table 1). The reperfusion strategy is shown in table 2. The time to the call and the time to the dispatching strategy (before the MICU management) were similar in both groups: mean time from occurrence of chest pain to arrival of MICU was 227 (256) vs 203 (190) min, during period 1 and period 2, respectively.

The time from arrival of the medical team to hospital reperfusion for patients with primary angioplasty was significantly improved in group 2 vs group 1 (table 3). The pre-hospital management reduction cannot be related to the distances covered because the duration of transfer was similar:

Table 1 Patient data and characteristics of acute myocardial infarction (AMI)

Variable	Period 1 (n = 56)	Period 2 (n = 42)
	n (%)	n (%)
Mean (SD)* age	62 (15*)	63 (15*)
Sex (% male)	75	79
AMI location:		
Anterior wall	24 (43)	20 (47)
Inferior wall	26 (46)	(45)
Other	6 (11)	3 (8)
Complications	8 (14)	4 (9)

Abbreviations: AMI, acute myocardial infarction; ECG, electrocardiogram; EMS, emergency medical services; MICU, mobile intensive care units

Table 2 Reperfusion strategy

	Period 1 (n = 56)	Period 2 (n = 42)
Reperfusion strategy	n (%)	n (%)
Pre-hospital thrombolysis	9 (16)	9 (21)
Primary angioplasty	44 (79)	32 (76)
None	3 (5)	1 (3)

11 (5) vs 9 (4) min ($p = 0.07$). For patients who received pre-hospital thrombolysis, time from arrival of the MICU to thrombolytic infusion was similar: 36 (16) min for group 1 vs 38 (21) min for group 2 ($p = 0.8$).

DISCUSSION

This study, performed according to quality control programme methodology, demonstrated that chronology of AMI management could be improved by appropriate interventions and monitoring of intervention times. We note also that the mean (SD) time from arrival of the MICU to arterial puncture was reduced from 95 (29) to 82 (16) min (table 3), which means that the process is now better managed and more predictable. The main corrective measures were to insist for a very early request for access to a catheterisation laboratory and also for direct admission to the catheter laboratory, which became systematic in period 2, bypassing admission to the ICU or emergency department. These measures helped to reduce the initial time spent upon arrival at the hospital and have been previously described in studies evaluating the whole pathway of AMI management.⁹

Authors' affiliations

Francois-Xavier Duchateau, M L Devaud, A Burnod, J Mantz, A Ricard-Hibon, Department of Anaesthesiology and Intensive Care, Beaujon University Hospital, Clichy, France

Competing interests: None declared

Table 3 Mean (SD) time intervals (in minutes) in the primary angioplasty group

	Period 1 (n = 46)	Period 2 (n = 33)	p Value
Arrival of MICU–arrival at hospital	67 (18)	58 (13)	0.02
Arrival of MICU–arterial puncture	95 (29)	82 (16)	0.03
Arrival at hospital–arterial puncture	29 (21)	26 (21)	0.56

MICU, mobile intensive care unit.

Correspondence to: Dr Francois-Xavier Duchateau, Department of Anaesthesiology and Intensive Care, Beaujon University Hospital, 100 Bd du Général Leclerc, 92110 Clichy, France; fxduchateau@wanadoo.fr

Accepted 1 May 2007

REFERENCES

- 1 Boersma E, Maas AC, Deckers JW, et al. Early thrombolytic treatment in acute myocardial infarction: reappraisal of the golden hour. *Lancet* 1996;**348**:771–5.
- 2 Cannon CP, Gibson CM, Lambrew CT, et al. Relationship of symptom-onset-to-balloon time and door-to-balloon time with mortality in patients undergoing angioplasty for acute myocardial infarction. *JAMA* 2000;**283**:2941–7.
- 3 ASSENT-4 PCI Investigators. Primary versus tenecteplase-facilitated percutaneous coronary intervention in patients with ST-segment elevation acute myocardial infarction (ASSENT-4 PCI): randomised trial. *Lancet* 2006;**367**:569–78.
- 4 Keeley EC, Boura JA, Grines CL. Comparison of primary and facilitated percutaneous coronary interventions for ST-elevation myocardial infarction: quantitative review of randomized trials. *Lancet* 2006;**367**:579–88.
- 5 Bradley EH, Herrin J, Wang Y, et al. Strategies for reducing the door-to-balloon time in acute myocardial infarction. *N Engl J Med* 2006;**355**:2308–20.
- 6 Pinto DS, Kirtane AJ, Nallamothu BK, et al. Hospital delays in reperfusion for ST-elevation myocardial infarction: implications when selecting a reperfusion strategy. *Circulation* 2006;**114**:2019–25.
- 7 Goldstein P, Wiel E. Management of prehospital thrombolytic therapy in ST-segment elevation acute coronary syndrome (<12 hours). *Miverva Anesthesiol* 2005;**71**:297–302.
- 8 Van de Werf F, Ardissone D, Betriu A, et al. Management of acute myocardial infarction in patients presenting with ST-segment elevation. The Task Force on the Management of Acute Myocardial Infarction of the European Society of Cardiology. *European Heart J* 2003;**24**:28–66.
- 9 Steg PG, Cambou JP, Golstein P, et al. Bypassing the emergency room reduces delays and mortality in ST elevation myocardial infarction: theUSIC 2000 registry. *Heart* 2006;**92**:1378–83.

Take advantage of BMJ Journals' remarkable catalogue of titles with Related Collections

No busy professional has time to browse through all pertinent journals to find relevant articles, but with Related Collections you no longer have to. Follow the "Related Collections" link from any article and use the "Show Collections from other Journals" to expand your search across all BMJ Journals. Or simply follow the "Browse by topic" link on the home page. By setting up your own collections and receiving email alerts every time an article is added to your chosen area, you can build up your own significant body of knowledge.