

Fast-tracking of myocardial infarction by paramedics

ABSTRACT – **Objective:** To study the effectiveness of a fast-track method of admitting patients with myocardial infarction directly to the coronary care unit (CCU).

■ **Study design:** Ambulance paramedic staff were trained and provided with a Life Pak XI Monitor/Defibrillator which can obtain a 12-lead electrocardiogram. When a diagnosis of acute myocardial infarction was made by the paramedics, the CCU was informed and the patient was directly transferred to the CCU, bypassing the accident and emergency (A&E) department. The appropriateness of admission to the CCU was assessed against set criteria. The time from call for help to the administration of thrombolytic therapy (thrombolysis time) in patients directly admitted to the CCU was compared with that in another group of patients with definite myocardial infarction who were admitted through the A&E department over the same period of time.

■ **Results:** Twenty-five patients were fast-tracked to the CCU. Diagnosis of myocardial infarction was confirmed on admission in 14. Thirteen were treated with thrombolysis as there were no contra-indications; of the other 11 patients, seven were diagnosed as angina, one had complete heart block, one had haemodynamically significant atrial fibrillation and two had non-cardiac chest pain. The average time from call for help to thrombolysis in this group was 82 ± 32 minutes. This was significantly shorter ($p < 0.02$) than in the patients who were admitted through A&E, in whom the average time from call for help to thrombolysis was 112 ± 35 minutes. Twenty-one of 25 fast-tracked patients fulfilled the criteria for CCU admission.

■ **Conclusion:** The majority of fast-trackings are appropriate and will result in quicker administration of thrombolysis in hospitals where the facility for thrombolysis does not exist in the A&E department.

Accident and emergency (A&E) departments in many hospitals do not have the facility for coronary thrombolysis. Patients with suspected myocardial infarction are first seen by the A&E medical officer and then referred to the medical team, who decide about the need for admission to the coronary care unit (CCU) and subsequent thrombolysis. This policy ensures appropriateness of admissions to the CCU, but causes unwanted delay in the 'door to needle' time for thrombolysis.

The problem could be solved if ambulance paramedic staff were trained to identify patients who were very likely to have had a myocardial infarction, and so could be admitted directly to the CCU. This should shorten the time to thrombolysis, but there is a risk that some might be

admitted inappropriately to the CCU; also the delay incurred by the paramedic staff taking a 12-lead electrocardiogram (ECG) might increase the time to appropriate treatment.

The effect of direct paramedic admission was tested in the present study.

Patients and methods

The study was conducted for six months in a district general hospital.

Thirty groups of ambulance paramedic staff serve the catchment population of the hospital. Ten who had indicated their willingness to take part in the study were trained to recognise anyone who was very likely to have had a myocardial infarction among patients with chest pain. They were provided with a Life Pak XI Monitor/Defibrillator, and were instructed in its use and the correct method of recording a 12-lead ECG. They attended tutorials on the ECG diagnosis of acute myocardial infarction and bundle branch block, in addition to the routine training in cardiac rhythm analysis. Special emphasis was laid on how to elicit the nature of chest pain and on differentiating ischaemic pain from pleuritic or musculoskeletal pain. Probability of myocardial infarction was considered high if ischaemic chest pain lasted more than 20 minutes and was associated with ST segment or T wave changes (ST elevation or depression; T inversion) in the ECG. If a patient's symptoms or ECG suggested high probability of myocardial infarction, the paramedics informed the CCU and transferred the patient directly to the CCU, bypassing the A&E department. These direct admissions to the CCU constituted the study group. On arrival at the CCU, patients were assessed by the CCU medical officer. If myocardial infarction was diagnosed and there was no contraindication, the patient was treated with thrombolysis. If admission was thought to be inappropriate, the patient was moved out of the CCU to the appropriate ward.

The remaining twenty groups of ambulance paramedics were allowed to continue their existing role, that is, admitting all '999' patients with chest pain to the A&E department. They did not have the opportunity to obtain a 12-lead ECG. If acute myocardial infarction was suspected, patients were referred to the CCU medical officer who decided about CCU admission and thrombolysis. These patients were included in the control group only if they were treated with thrombolysis.

Myocardial infarction was diagnosed on admission when ischaemic chest pain was associated with development of new Q waves (0.04 ms duration) and/or ST segment changes suggestive of transmural ischaemia in at least two leads of the standard 12-lead ECG.

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Admission to the CCU by the paramedics was considered appropriate if there were ischaemic changes or left bundle branch block in the ECG, or any cardiac dysrhythmia necessitating immediate intervention.

The emphasis throughout the training and the trial was that the interests of the patient come foremost and must not be put in jeopardy in order to carry out any procedure.

Patients were recorded as 'direct CCU admission' or 'A&E admission'. Patients admitted by specially trained paramedics to the A&E department were recorded as A&E admission even if they were subsequently diagnosed as myocardial infarction and transferred to CCU for thrombolysis.

The mean time from the patient calling '999' (call for help) to the administration of thrombolytic therapy was calculated separately in each patient group (thrombolysis time). The result was expressed as mean plus or minus standard deviation (SD). Unpaired Student's *t* test was used to test the significance in the difference between the two means.

Results

Twenty-five patients were fast-tracked to the CCU by the paramedics. History and electrocardiogram confirmed the diagnosis of myocardial infarction in 14 and 13 were treated with thrombolysis, as there were no contra-indications. Of the 11 patients who had not had a myocardial infarction, seven were diagnosed as having angina, one had complete heart block, and one had haemodynamically significant atrial fibrillation; of two with non-cardiac chest pain, one had epigastric pain and abdominal signs of acute cholecystitis, with ECG evidence of old inferior infarction; the other had chest pain and syncope, T wave inversion in right precordial chest leads, and was diagnosed as having had a probable pulmonary embolism.

Of the seven patients diagnosed as angina on admission, two did not have any significant ECG changes and were moved out of the CCU. The other five patients with angina had T wave inversion with or without ST depression on the ECG and were managed as unstable angina in the CCU; three progressed to myocardial infarction with significant increase in plasma cardiac enzyme activity. The two patients with non-cardiac chest pain were transferred to the ward (Table 1).

Table 1. Appropriateness of direct CCU admission

Diagnosis	Number	Placement after initial assessment	
		CCU	Ward
Myocardial infarction	14	14	–
Angina	7	5	2
Complete heart block	1	1	–
Atrial fibrillation	1	1	–
Non-cardiac chest pain	2	–	2
Total	25	21	4

Over the same period, 43 consecutive patients were admitted through the A&E department with a diagnosis of acute myocardial infarction. Thirty-six of them were treated with thrombolysis; six had contra-indications for thrombolysis; one was too late for thrombolysis.

The mean time from call for help to thrombolysis in 13 patients admitted directly to the CCU was 82±32 minutes, whereas in the 36 patients admitted through the A&E department it was 112±35 minutes. ($p<0.02$).

Discussion

Although thrombolysis has beneficial effects in acute myocardial infarction up to 12 hours after onset of symptoms, the best results are achieved when treatment is given within the first hour¹. Eligible patients should receive thrombolysis within 90 minutes of alerting medical or ambulance services². Several strategies have been devised to speed therapy. Depending on local circumstances, this may involve direct admission to the CCU, fast-track assessment in emergency departments, or pre-hospital thrombolytic treatment. Paramedic-administered pre-hospital thrombolysis shortens the 'call to needle time'. This has been shown to be feasible and safe³⁻⁵, but requires a hospital physician or the general practitioner to be present on site. Alternatively, the ECG needs to be transmitted to the hospital where a physician makes the decision regarding thrombolysis. Using trained paramedics for pre-hospital triage in the manner shown in the present study obviates the need for the presence of a physician on site or the need to transmit ECGs to hospital.

In our study, direct admission of patients with acute myocardial infarction to the CCU shortened the mean thrombolysis time by 30 minutes compared with conventional admission through the A&E department. It was shown in a previous study that thrombolysis time was significantly shorter when thrombolysis was available in the A&E department, rather than after transfer to the CCU⁶. The time gain in that study was 24 minutes, which is comparable to our result. Direct admission to the CCU is therefore an alternative to thrombolysis in A&E, which may be useful in hospitals with no facility for coronary thrombolysis in the A&E department.

We assessed the appropriateness of direct CCU admission against predetermined criteria that included patients with significant cardiac dysrhythmia. This was because it was not thought justifiable to withhold the opportunity for quicker access to specialised care from patients with haemodynamically unstable cardiac arrhythmias. Only four patients (16%) were considered inappropriate for CCU admission and were moved out to the ward. The majority of 'fast-trackings' were therefore appropriate.

Fast-tracking of patients with myocardial infarction by paramedics not only eliminates delays in transferring patients from A&E to the CCU, but also makes best use of the skills of the experienced paramedics and prevents

unnecessary repeated assessment of critically ill patients by medical and nursing staff.

Conclusion

Fast-tracking of patients with myocardial infarction to the CCU by trained paramedics results in quicker administration of thrombolysis, without a significant proportion of inappropriate admission to the CCU.

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