

Patients with suspected myocardial infarction: effect of mode of referral on admission time to a coronary care unit

R A S AHMAD

S BOND

J BURKE

S P SINGH

R D S WATSON

SUMMARY. *The aim of this prospective study was to determine the delay between the onset of symptoms and arrival in the coronary care unit of patients with suspected acute myocardial infarction, and the relative contribution to the total delay of patient delay, method of referral (self referral or general practitioner referral) and delay in the hospital before reaching the coronary care unit. All patients admitted with chest pain to the coronary care unit at Dudley Road Hospital, Birmingham, over the six month period April–September 1989 were included in the study. Ninety five patients were referred by their general practitioner and 107 patients attended the accident and emergency department directly or arrived by ambulance without contacting their general practitioner. The proportion of self referred and general practitioner referred patients with acute myocardial infarction, angina and non-cardiac chest pain were not significantly different. The total delay was significantly longer for patients who had been referred by their general practitioner (median 5.3 hours) than for self referrals (3.2 hours, $P < 0.001$), with a significantly higher proportion of self referrals arriving at the coronary care unit within six hours of the onset of symptoms (77% versus 54%, $P < 0.01$). Among general practitioner referrals, initial patient delay accounted for a median of 2.5 hours and the general practitioner's response time for a median of 1.1 hours. The delay in hospital was similar for both groups of patients.*

In inner city areas, self referral may result in considerably less delay than general practitioner referral allowing a greater proportion of patients to receive effective thrombolytic therapy. Educating patients to seek help early and initiation of thrombolytic therapy in the accident and emergency department or at home by the general practitioner may all be required to optimize the delivery of thrombolytic therapy.

Keywords: *myocardial infarction; treatment delay; referral to hospital for admission; patient self referral; thrombolytic therapy.*

R A S Ahmad, MRCP, cardiology registrar; S Bond, SRN, coronary care sister; J Burke, SRN, coronary care sister; S P Singh, FRCP, consultant cardiologist; and R D S Watson, FRCP, consultant cardiologist, Department of Cardiology, Dudley Road Hospital, Birmingham. Submitted: 8 October 1990; accepted: 31 October 1991.

Introduction

THE advent of effective thrombolytic therapy for acute myocardial infarction has increased awareness of the need for prompt hospital admission of patients with suspected infarction. The time window for effective salvage of injured myocardium is generally considered to be up to six hours after the onset of major symptoms and the most dramatic benefit is seen in patients treated within one hour.¹ It is therefore imperative that local admission policies for patients with suspected infarction are examined in order to detect preventable delays and allow early treatment for the majority of eligible patients.

The aim of this study was to survey prospectively all patients admitted to a coronary care unit with chest pain in order to determine the delay between the onset of symptoms and the time of arrival in the unit, and the factors that contribute to this delay. Of particular interest was the influence of the method of referral (general practitioner referral or self referral to the accident and emergency department) on the total delay and the delay in the hospital before reaching the coronary care unit.

Method

Dudley Road Hospital is a district general hospital located in a socially deprived inner city area of Birmingham with a large ethnic minority. The six-bed coronary care unit is one of seven such units in the city. All 213 patients admitted to the coronary care unit with chest pain over the six month period April–September 1989 were surveyed. Eleven patients had been transferred from within Dudley Road Hospital or other local hospitals and were excluded. Data were therefore available for 202 patients who had been directly admitted to the unit. Ninety five of the 202 patients (47%) had been referred to hospital by their general practitioner, and 107 were self referrals who had either attended the accident and emergency department directly or dialled 999 and requested an ambulance. Patients instructed by their general practitioner to telephone for an ambulance were considered to be self referrals. All the patients had been considered to have acute myocardial infarction, suspected infarction or unstable angina on initial assessment in the accident and emergency department.

Data were entered on specially designed forms as soon as possible after the patients' arrival at the coronary care unit. Similar forms had been in use for the purpose of medical audit for six months prior to the study. All data were cross checked with the unit's admissions register for completeness and subsequently entered into a specially designed computerized database (DBASE IV, Ashton Tate).

The time of arrival at the hospital (taken from the attendance records of the accident and emergency department), and the time of arrival at the coronary care unit were recorded. The patient was questioned regarding the presence and severity of chest pain on arrival at the unit. The severity was recorded as: mild, moderate or severe and further analgesia was administered as required. The patient, relatives, escort or interpreter, as appropriate, were questioned regarding the time of onset of chest pain or other major symptoms, the method of referral, the delay from onset of symptoms to the attempt to contact the general practitioner (patient delay), the subsequent delay before being

attended by the general practitioner (general practitioner response time), and the method of transport to hospital. The total delay was taken as the difference between the time of onset of major symptoms and time of arrival at the coronary care unit.

The diagnosis on discharge from the coronary care unit (generally 24–48 hours later) was obtained from the patients' records. The diagnosis of myocardial infarction was confirmed by serial electrocardiogram and by determining the concentration of the serum enzymes which when raised indicate myocardial infarction (aspartate aminotransferase, lactic dehydrogenase and creatine kinase).

Statistics

The frequency distribution of all delay times was highly negatively skewed. The data were therefore summarized using the median and interquartile range (25th to 75th percentile), and the Mann-Whitney *U* test was used to compare group medians. Discrete variables were compared using the chi square test. All statistical analyses were carried out using the commercially available computer software MINITAB. A *P* value of less than 0.05 was considered significant.

Results

The personal characteristics of the general practitioner referred and self referred patients are shown in Table 1, together with the severity of pain they experienced on arrival at the coronary care unit and their diagnosis on discharge from the coronary care unit. Significantly more self referrals than general practitioner referrals were Asian patients. The proportion of patients experiencing moderate or severe pain was similar in both groups. The proportion of general practitioner and self referred patients with confirmed myocardial infarction, angina (cardiac chest pain but no evidence of necrosis) and non-cardiac chest pain was not significantly different. The majority of patients were transferred to hospital by ambulance (68% and 70% of general practitioner and self referrals, respectively).

The time of onset of major symptoms and the total delay could be established for 179 patients — 92% of general practitioner referrals (*n* = 87) and 86% on self referrals (*n* = 92). The median total delay for these 179 patients was 3.6 hours (interquartile range 2.7–7.2 hours). Of the 179 patients 118 (66%) arrived at the coronary care unit within six hours of the onset of major symptoms (95% confidence interval 59% to 73%).

Table 1. Personal characteristics, severity of chest pain on arrival at coronary care unit and discharge diagnosis for all self referrals and general practitioner referrals.

	Self referred patients (<i>n</i> = 107)	GP referred patients (<i>n</i> = 95)
Mean age (SD) (years)	60 (10)	60 (9)
% of men	76	71
% of Asian patients	28	15*
<i>Chest pain on arrival</i>		
% of patients in pain	62	56
% of patients with moderate or severe pain	28	24
<i>Discharge diagnosis</i>		
Acute myocardial infarction	57	44
Angina	27	38
Non-cardiac chest pain	16	18

n = number of patients in group. SD = standard deviation. **P* < 0.05.

The total delay for general practitioner referrals was significantly longer than for self referrals (Table 2) — estimated difference 1.8 hours (95% confidence interval 0.5 to 3.3 hours). The proportion of patients arriving at the coronary care unit within six hours of onset was also significantly higher among self referrals than among general practitioner referrals (77% versus 54%, *P* < 0.01). The proportions arriving within 10 hours of onset were 89% and 78%, respectively (*P* < 0.05).

The patient delay and general practitioner response time could be established for 74 (85%) of the 87 general practitioner referrals analysed; these are shown in Table 2. The median in hospital delay for both groups combined was 57 minutes and this was not related to the mode of referral (Table 2).

The median total delay for the 89 patients with proven myocardial infarction (3.4 hours (2.4–6.3 hours)) was less than for the 90 patients without infarction (4.6 hours (3.0–8.1 hours)) but the difference was not quite significant. The proportion of patients arriving within six hours of onset was significantly higher in patients with confirmed infarction than in those without (73% versus 59%, *P* < 0.05).

The mode of transport had no significant influence on the total delay — for the 127 patients travelling by ambulance the median delay was 4.2 hours, while for the 52 patients using other modes of transport the median delay was 3.8 hours.

Table 2. Total, patient, general practitioner and hospital delay for the self referred and general practitioner referred patients.

Delay	Median delay (interquartile range) (hours)	
	Self referred patients	GP referred patients
Total (<i>n</i> = 92/87)	3.2 (2.1–5.3)	5.3*** (3.2–9.0)
Patient (<i>n</i> = 74)	—	2.5 (1.0–7.3)
General practitioner (<i>n</i> = 74)	—	1.1 (0.6–4.5)
Hospital (<i>n</i> = 92/87)	1.0 (0.5–1.3)	0.9 (0.7–1.3)

n = number of self referred/GP referred patients. ****P* < 0.001.

Discussion

The results of this study demonstrate that most of the delay in admission of patients with suspected myocardial infarction to a coronary care unit occurs during the pre-hospital phase, and is largely due to patient delay in seeking medical assistance, confirming the results of previous studies.^{2–4}

In addition, it was found that the method of referral to hospital (general practitioner referral or self referral) had a substantial influence on the delay in admission. This has not been examined in previous studies which excluded self referred patients^{2–4} or were restricted to patients with confirmed infarction^{4,5} or those admitted within six hours of the onset of symptoms.⁴ The delay between the onset of symptoms and arrival in the coronary care unit, where thrombolytic therapy was started, was considerably longer for patients referred to hospital by their general practitioner than for those attending the accident and emergency department directly or arriving in hospital by emergency ambulance. While this is not entirely unexpected, the extent of the difference (median 1.8 hours) was striking and its potential influence on the delivery and efficacy of thrombolytic therapy is likely to be important.

The influence of a prior history of ischaemic heart disease on the method of referral or the pre-hospital delay was not examined. In a previous study, patient and total delay were longer in patients aged over 70 years than in younger patients, but were similar in those with and without a previous history of angina or infarction.⁴ In this study, the age and sex distributions of

self referred and general practitioner referred patients were similar. Interestingly, Asian patients, who constituted 22% of admissions to the unit, were nearly twice as likely to attend the accident and emergency department directly than to contact their general practitioner.

It is possible that patients with proven acute myocardial infarction and/or severe initial symptoms are more likely to present early and to attend the accident and emergency department directly. However, in this study although patients with proven infarction did tend to present earlier than those without, and constituted a higher proportion of self referrals than of general practitioner referrals, these differences were not statistically significant. Furthermore the proportion of patients with cardiac chest pain (angina or myocardial infarction) among self referrals and general practitioner referrals were similar as were the proportions still experiencing chest pain on arrival at the coronary care unit, and the proportions with moderate or severe pain. Differences in the proportion of patients with proven infarction and/or severe symptoms are therefore unlikely to account for the observed differences in the pattern of referral or the total delay.

These results, if applicable to other inner city hospitals, have important implications for the delivery of thrombolytic therapy for acute myocardial infarction. Clearly, all patients known to have ischaemic heart disease should be educated regarding the symptomatology of acute myocardial infarction and the need to seek help early if they develop anginal pain unresponsive to rest and nitroglycerine within 15 to 20 minutes. Efforts to increase public awareness of the availability of effective treatment for myocardial infarction and the value of early presentation would also be expected to lead to more prompt referral.

Patients living in inner city areas, particularly those near a major accident and emergency department may be best advised to attend the hospital directly. However, this clearly does not apply to patients living in a remote or rural area for whom prompt attendance by the general practitioner and initiation of thrombolytic therapy at home may be preferable. In semi-rural areas, coordination between the general practitioner, ambulance personnel, and the nearest coronary care unit may allow the flexibility required for treatment to be delivered as early as possible. As discussed by de Bono,⁶ the method of delivery of thrombolysis in various areas may have to be based on these geographical factors.

In one study,² direct admission of general practitioner referrals to the coronary care unit was shown to reduce the total delay and allow a greater proportion of patients to receive thrombolytic therapy. However, from the results presented here it can also be argued that the delay between onset of symptoms and receiving medical care in the coronary care unit for general practitioner referrals is less than six hours in the majority of cases. If general practitioners were willing to initiate thrombolytic therapy at the patient's home, this would lead to a major reduction in the time to delivery of this life saving treatment.

Since most people in the United Kingdom live in urban or semi-rural areas, a large proportion of patients with acute myocardial infarction will continue to be admitted directly to hospital without contacting their general practitioner. A number of measures could reduce the subsequent delay in the hospital, which accounted for between one fifth and one third of the total delay in the patients studied here. Streamlining the initial assessment of patients with suspected infarction, prompt recording of electrocardiograms, and initiation of thrombolytic therapy in the accident and emergency department or an intermediate area rather than in the coronary care unit could lead to a further small but worthwhile reduction in the total delay.

References

1. Gruppo Italiano per lo Studio della Streptochinasi nell'Infarto Miocardico (GISSI). Effectiveness of intravenous thrombolytic treatment in acute myocardial infarction. *Lancet* 1986; **1**: 397-401.
2. Burns JMA, Hogg KJ, Rae AP, *et al.* Impact of a policy of direct admission to a coronary care unit on use of thrombolytic treatment. *Br Heart J* 1989; **61**: 322-325.
3. Smyllie HC, Taylor MP, Cuninghame-Green RA. Acute myocardial infarction in Doncaster. II. Delays in admission and survival. *BMJ* 1972; **1**: 34-36.
4. Rawles JM, Haites NE. Patient and general practitioner delays in acute myocardial infarction. *BMJ* 1988; **296**: 882-884.
5. Pai GR, Haites NE, Rawles JM. One thousand heart attacks in Grampian: the place of cardiopulmonary resuscitation in general practice. *BMJ* 1987; **294**: 352-354.
6. de Bono DP. Minimising delays before thrombolytic treatment. In: *Practical coronary thrombolysis*. Oxford: Blackwell, 1990.

Acknowledgment

We thank all the nursing staff of the coronary care unit at Dudley Road Hospital for careful collection of the data.

Address for correspondence

Dr R A S Ahmad, Cardiothoracic Unit, Walsgrave Hospital, Clifford Bridge Road, Coventry CV2 2DX.

RCGP

Courses
and
conferences



PERSONNEL MANAGEMENT COURSE

20 and 21 May
13 and 14 October

This course aims to give general practitioners and practice managers an appreciation of the processes and skills required to improve organizational performance through the effective recruitment and selection of staff; the development of staff through performance appraisal; addressing disciplinary issues; and the explicit and implicit terms of the contract of employment. The fee is £200 for members and £250 for non-members. PGEA approval for 2 days under service management.

MANAGING GENERAL PRACTICE IN THE 90s

19 and 20 June, 4 and 5 September
27 and 28 November

This course is designed to be of principal benefit to those general practitioners and practice managers who have some management experience or hold the AHCPA intermediate management diploma. This new two day course will look at the policy, strategy and operational needs of practice management, and in particular will concentrate on the needs of managing for quality through performance review and audit. The fee is £200 for members and £250 for non-members. PGEA approval for 2 days under service management.

Further details and an application form are available from the Corporate Development Unit, Royal College of General Practitioners, 14 Princes Gate, London SW7 1PU. Tel: 071-823 9703. Fax: 071-225 3047.