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Patient and general practitioner delays in acute myocardial infarction

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Abstract

The longest component of the total delay in coming under coronary care is patient delay, and it has been suggested that public education might be used to make it shorter. The patterns of patient delay were studied in 450 patients with acute myocardial infarction uncomplicated by cardiac arrest out of hospital, of whom 243 had a previous history of ischaemic heart disease. Patient delays had a skewed distribution with a modal delay of up to one hour, a median delay of two hours, and a mean delay of 10 hours. Two thirds of patients had sought help from their general practitioners within four hours of the onset of symptoms. During the first four hours the longer that patients delayed the lower was the subsequent mortality (27%, 18%, and 9% for delays of one hour or less, up to two hours, and up to four hours, respectively), but patients who delayed four to eight hours had the highest mortality of all (38%). Neither the median value nor the pattern of patient delays was altered by a previous history of ischaemic heart disease.

There were pronounced differences in doctor delays, depending on the patient's age, delay time, and ultimate place of treatment, showing that the doctors' behaviour was influenced before they had seen their patients. Nevertheless, the median total delay for patients aged up to 70 was one hour 35 minutes, and a higher proportion of patients were seen early after infarction than in recent hospital trials of thrombolytic treatment.

These findings suggest that the patients' call for help and the doctors' response may be at an instinctive level according to the patients' distress; these patterns of behaviour may be difficult to modify by public education.

Introduction

In recent trials of thrombolytic treatment given in coronary care units the earlier that treatment was started after the onset of symptoms the greater was the reduction of late mortality from myocardial infarction.[1,2] The largest single component of the total time for a patient with myocardial infarction to come under coronary care is that taken by the patient to decide to summon help.[3-5] In several reports median patient delays have been between one and two hours, but factors associated with patient delay have not been studied in detail.

It has been hoped that patient delay might be shortened by educating the public about symptoms of myocardial infarction and the importance of reporting them early. Besides its relevance for early thrombolytic treatment, summoning help promptly is important for successful resuscitation from cardiac arrest, a complication that occurs early in myocardial infarction.

In this paper we examine the patterns of behaviour of patients with acute myocardial infarction uncomplicated by early cardiac arrest and consider the scope for altering patient behaviour by education.

Patients and methods

Four hundred and fifty patients were selected from a consecutive series of 1011 with heart attacks that occurred in general practices equipped with defibrillators.[6] Each practice had one doctor on duty throughout the 24 hours for emergency calls, who carried a radiopager and had a defibrillator in the car. Practice receptionists were told to pass on quickly to the duty doctor calls about suspected heart attacks. By means of a weekly visit or telephone call to a nominated practice representative data on all heart attacks in these practices were obtained. A record was kept by the doctors of the time between the onset of symptoms and the request for a doctor to visit ("patient delay") and the interval between the receipt of the call and the arrival of the doctor ("doctor delay").

Only patients with definite acute myocardial infarction whose first medical contact was the general practitioner and for whom a patient delay time was available are included in this study. Patients who were dead when the general practitioner arrived or in whom a resuscitation attempt was made are excluded.

Myocardial infarction was diagnosed by a history of characteristic chest pain lasting at least 20 minutes, plus either an electrocardiogram showing infarction or a rise in cardiac enzyme activities above normal, or unequivocal serial electrocardiographic changes of infarction, or evidence at necropsy of recent myocardial infarction.

Wilcoxon's test and Kendal's rank correlation were the non-parametric statistical tests used.

Results

Figure 1 shows the numbers of patients with various delay times presented logarithmically. The distribution was extremely skewed, the modal patient delay being up to one hour, the median two hours, and the mean 9·9 hours. Within the first four hours of patient delay there was a reduction of mortality from 27% for a delay of one hour or less to 18% for a delay of up to two hours and to 9% for a delay of up to four hours; these differences were significant ($\chi^2=7{\cdot}88$; df=2; $p<0{\cdot}05$). The highest mortality of any group (38%) was in those presenting at four to eight hours, and the next highest (32%) among the 22 patients who presented more than 64 hours after the onset of symptoms.

Table I gives the numbers of patients with various delay times stratified

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separately for those with and without a past history of ischaemic heart disease. The proportions of patients with and without previous ischaemic heart disease with delays of up to four hours were respectively 69% (167/243) and 65% (135/207), and the median delays in the two groups were not significantly different (p=0·11).

Median delay was greater in patients aged over 70 than in younger patients (p<0·001), and with patient delays of up to four hours patient delay was positively correlated with age (τ=0·1; p<0·05).

Doctor delays were less skewed than patient delays, the modal, median, and mean values being up to 15, 15, and 21·3 minutes respectively. The median doctor delay for patients aged up to 70 was 10 minutes and for patients aged over 70, 15 minutes (p<0·01). With patient delays of up to four hours there was a positive correlation between doctor and patient delay times (τ=0·185; p<0·001). Table II gives the mean ages and patient and doctor delays for patients treated in a coronary care unit, general medical ward, cottage hospital, and at home. Before seeing the patient the doctor's behaviour was modified according to the ultimate place of treatment, the doctor taking longer to reach patients treated at home compared with those admitted to hospital.

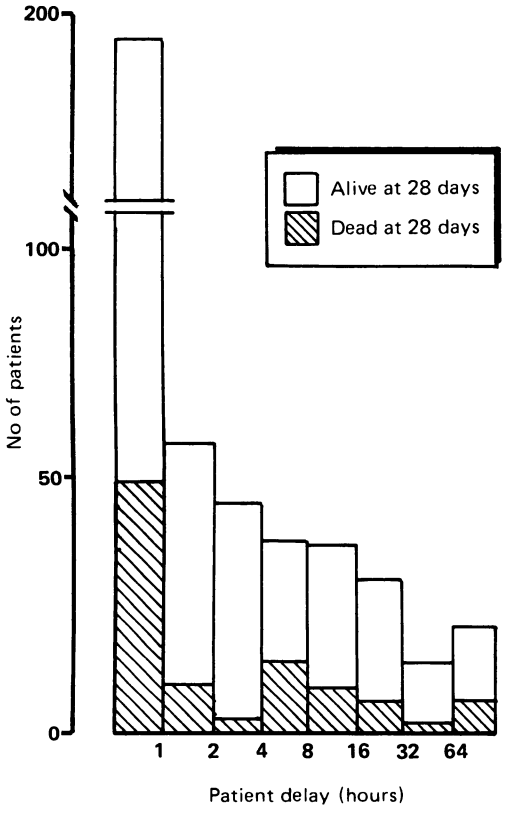

FIG 1—Numbers of patients with various patient delays who were alive or dead at 28 days. Note logarithmic time scale.

TABLE I—*Number (percentage) of patients with various delays and their 28 day mortality with and without a previous history of ischaemic heart disease*

	Patient delay (hours)								
	≤1	−2	−4	−8	−16	−32	−64	>64	All
				No ischaemic heart disease					
Alive	67	23	23	12	15	20	4	7	171
Dead	16 (19)	5 (18)	1 (4)	5 (29)	2 (12)	5 (20)	1 (20)	1 (13)	36 (17)
Total	83 (40)	28 (14)	24 (12)	17 (8)	17 (8)	25 (12)	5 (2)	8 (4)	207 (100)
				Previous ischaemic heart disease					
Alive	76	26	20	13	14	5	9	9	171
Dead	36 (32)	6 (19)	3 (13)	10 (43)	8 (36)	2 (29)	1 (10)	6 (43)	72 (30)
Total	112 (46)	32 (13)	23 (9)	23 (9)	22 (9)	7 (3)	10 (4)	14 (6)	243 (100)
				Combined					
Alive	143	49	43	25	29	25	13	15	342
Dead	52 (27)	11 (18)	4 (9)	15 (38)	10 (26)	7 (22)	2 (13)	7 (32)	108 (24)
Total	195 (43)	60 (13)	47 (10)	40 (9)	39 (9)	32 (7)	15 (3)	22 (5)	450 (100)

TABLE II—*Mortality, age, and patient and doctor delay times for treatment of acute myocardial infarction at home or in hospital*

		Coronary care unit	General ward	Home	Cottage hospital	All
No of patients		146	209	58	37	450
No (%) who died		21 (14·4)	70 (33·5)	9 (15·5)	8 (21·6)	108 (24·0)
Mean age (years)		56·8	72·1	69·0	70·4	66·6
Patient delay (min)	Median	60	120	540	120	120
	Range	2-5940	1-5940	1-5940	5-3000	1-5940
	Mean	275	644	1374	339	594
Doctor delay (min)	Median	10	15	20	10	15
	Range	2-90	1-180	2-180	5-600	1-600
	Mean	16·2	19·8	35·4	27·9	21·3
Significance of difference in doctor delay for hospital *v* home		p<0·0001	p<0·01		NS	

Figure 2 shows the cumulative percentage of patients who were seen by their general practitioners after various total delay times. Younger patients were seen sooner than older patients, the median total delays being one hour 35 minutes for patients aged up to 70, three hours 20 minutes for patients aged over 70 (p<0·001), and two hours 10 minutes for all ages.

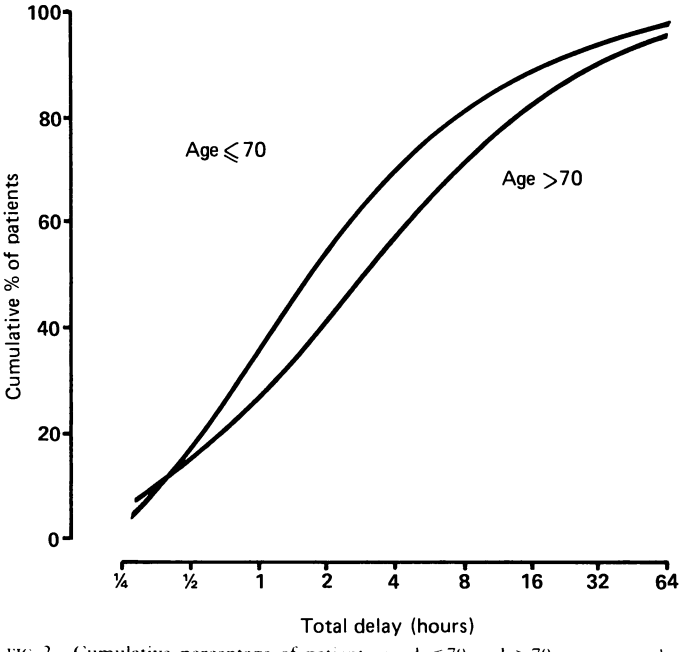

FIG 2—Cumulative percentage of patients aged ⩽70 and >70 coming under general practitioner care after various total (patient+doctor) delays (logarithmic time scale).

Discussion

In this paper we describe a group of patients with myocardial infarction who had not suffered a cardiac arrest by the time that they had summoned and been seen by their general practitioners. Their overall mortality was substantial (108 dead; 24%) but was unevenly distributed in relation to patient delays. Mortality was three times as high in those patients presenting up to one hour (27%; 52/195) compared with those presenting two to four hours after the onset of symptoms (9%; 4/47). The explanation may be that the propensity to develop ventricular fibrillation (causing death after the patient has been seen by the general practitioner) falls exponentially with time after the onset of symptoms. An alternative but not mutually exclusive explanation may be that the length of time that the pain of myocardial infarction is tolerated is inversely related to the size of the infarct (the main determinant of late mortality). We may surmise that help is summoned when a pain threshold is reached, the threshold rising with age. The time for the pain of infarction to reach threshold is shorter with larger infarcts, which are associated with higher mortality.

The highest mortality of any group was in those with a patient

delay of four to eight hours. Such patients may summon help not because of pain but because of the onset of complications of infarction, such as left ventricular failure causing breathlessness. Twenty two patients (5%) presented more than 64 hours after myocardial infarction. In these it seems possible that but for the onset of complications or recurrence of pain they would not have called for help at all. These data suggest some hypotheses about patient behaviour, and more work is needed to determine why patients present at the times they do.

The median delay in patients with a past medical history of ischaemic heart disease was not significantly different from that in patients without such a history (table I). Further, the same pattern of declining mortality with increasing delay up to four hours and a sharp rise in mortality with delays of four to eight hours was seen in both groups. Thus patients' behaviour was not modified by past experience of a myocardial infarction or diagnosis of angina.

Much of the behaviour of patients with collapse, pain, or pathological breathlessness after myocardial infarction is at an instinctive level, and though to some extent it may be culturally determined, it is unlikely to be readily modified by necessarily superficial public education. For these reasons, and because of the skewed distribution of patient delays and their relation to late mortality, the scope for reducing mortality by a general reduction of patient delay may be limited. It is unrealistic to expect patients presenting within one hour to call much earlier, but those who delay two to four hours already have a low mortality. On the other hand, those who delay four to eight hours may have suffered extensive irreversible infarction and present too late for any amelioration. For these patients to present earlier a qualitative change in their behaviour would be required.

Elements of the general practitioner's behaviour towards a patient with myocardial infarction may also be at a subconscious level. Doctor delay is greatly influenced before the patient has been seen, depending on the patient's age, delay time, and ultimate place of treatment. In many cases little of this information will be available to the doctor before setting off on a call, so the urgency of response must depend on some other factor, the most likely being the anxiety content of the message summoning him. This in turn may be related to the patient's distress and perception of mortal danger. Thus both the patient's cry for help and the doctor's response may to some extent be instinctive and therefore not readily modified.

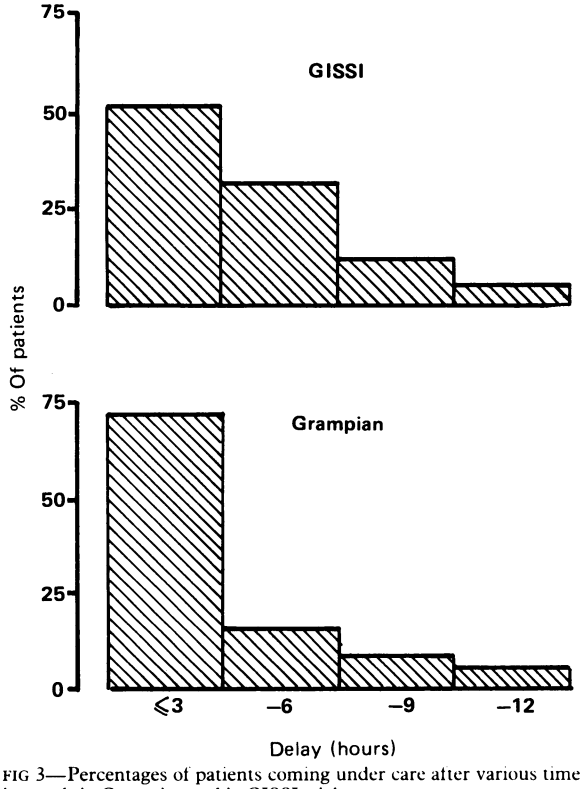

FIG 3—Percentages of patients coming under care after various time intervals in Grampian and in GISSI trial.

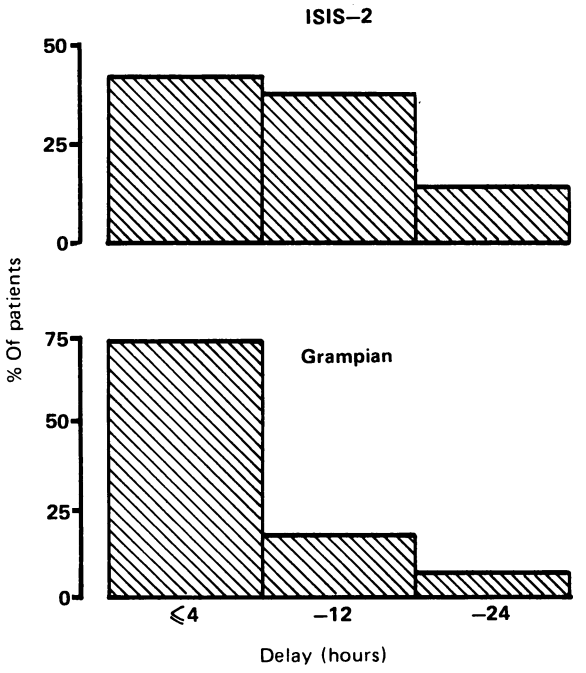

FIG 4—Percentages of patients coming under care after various time intervals in Grampian and in ISIS-2 trial.

In our study the net result of the behavioural interaction between patient and doctor was a median patient delay of two hours, a median doctor delay of 15 minutes, and a median total delay of two hours 10 minutes. Median total delays reported from Edinburgh,[3] Doncaster,[4] Teesside,[5] and by British immediate care doctors (BASICS)[7] were 134, 143, 91, and 60 minutes respectively. These results, however, are not directly comparable with our own of 130 minutes, as they were greatly influenced by the study population's age structure and the inclusion or exclusion of cases of collapse or belated notification. Thus the very short delay reported by BASICS is explained by the inclusion of a high proportion of sudden deaths and the exclusion of patient delays of more than 24 hours and patients over 70.

In recent Italian (GISSI) and international (ISIS-2) trials of thrombolytic treatment for acute myocardial infarction the greatest reduction of mortality was in the early treatment subgroups.[1,2] Figure 3 shows the proportions of patients seen after various time intervals by general practitioners with a policy of rapid response to heart attack calls in Grampian compared with the proportions at the time of randomisation in the GISSI study; in figure 4 similar comparison is made with ISIS-2. In Grampian a higher proportion of patients with myocardial infarction were seen early than in these trials conducted in coronary care units.

We thank all the general practitioners (listed in reference 6) who participated in this study.

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