Analysis of time intervals involved in admission to a coronary care unit

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SUMMARY. Time intervals between the onset of the presenting symptom (chest pain) and arrival in a coronary care unit were studied for 221 admissions arranged by conventional means. The median figure for " patient delay " was 60 minutes, for " general-practitioner delay " 20 minutes, for " ambulance delay " 30 minutes, and for " transit delay " 30 minutes. The median " total delay " was three hours 30 minutes.

Only 4·5 per cent of the patients were under intensive coronary care within one hour, the time of the highest mortality risk. A mobile coronary service should be capable of increasing the proportion of patients brought under special care within the first hour, but the time taken by the patient to realise the nature of the emergency and summon aid is likely to remain the most critical factor.

Introduction

About three-quarters of all deaths after acute myocardial infarction before the age of 70 years are likely to occur outside hospital if only conventional medical care is available (Armstrong *et al.*, 1972). The high proportion of deaths outside hospital is attributable to the particular dysrhythmic danger of the first hour, during which half of the first month mortality occurs. Because these early life-threatening dysrhythmias may be preventable, there is growing interest in the possibility of bringing patients under medical care at the earliest possible moment (Pantridge and Webb, 1973). A study of the time intervals between the onset of symptoms (chest pain) and arrival in this hospital's coronary care unit was therefore undertaken in an attempt to identify avoidable sources of delay and to assess the possible scope for some form of mobile coronary care service.

Method

Information about the time intervals between the presenting symptom (almost invariably chest pain in this series) and admission to the coronary care unit was sought in 285 admissions during a ten-month period. All were admitted to the unit as cases of acute myocardial infarction or coronary occlusion. Approximately 50 per cent of those admitted came from the urban area (radius five miles) and 40 per cent from the surrounding semi-rural area (radius five to 20 miles). A further ten per cent lived more than 20 miles from the hospital.

No relevant information was obtained for 64 of the 285 admissions, 13 patients being too ill to provide details and 23 having been admitted or re-admitted from other wards or hospitals.

Of the study population, which comprised 221 admissions, 219 were aged 30–70 years, the other two being older. Eighty-four per cent were male and 16 per cent female. Definite myocardial infarction as diagnosed by the WHO criteria (1959) had occurred

in 125 cases (57 per cent), the final diagnoses in the remaining 96 being shown in table 1; 70 of these 96 admissions were for ischaemic cardiac pain with or without dysrhythmia, although frank infarction could not subsequently be diagnosed on the criteria stated.

TABLE 1
FINAL DIAGNOSES IN 96 PATIENTS NOT SUFFERING DEFINITE MYOCARDIAL INFARCTION

Diagnosis	*Number of patients*
Ischaemic cardiac pain	64
Pericarditis	8
Dysrhythmia and angina	6
Musculoskeletal pain	3
Hiatus hernia	3
Munchausen syndrome	3
Acute left ventricular failure	2
Myocarditis	2
Pulmonary embolism	2
Pneumonia	2
Cerebrovascular accident	1

The intervals studied were:

(a) Time from onset of presenting symptom to contacting the general practitioner = " patient delay ",

(b) Time from general practitioner being contacted to his attendance = " general-practitioner delay ",

(c) Time between arrival of the general practitioner and arrival of the ambulance at the patient's home. This time was composite and included the time spent in reaching a diagnosis and contacting the ambulance station and the travelling time of the ambulance = " ambulance delay ",

(d) Time from arrival of ambulance at the patient's home to his arrival in the unit. This time was also composite and included transfer of the patient into and out of the ambulance, the travelling time and, where applicable, the time spent in the admissions unit = " transit delay ",

(e) Time between arrival at the admissions unit and arrival at the unit = " admissions unit delay ",

(f) Total time from onset of presenting symptom to arrival in unit = " total delay ".

Data recorded under the above headings were further subdivided into notional day (0800–2200 hours) and night (2200–0800 hours). When time intervals were less than one hour, the figures reported by the patients and/or their relatives and friends were approximated to the nearest five minutes; over one hour, approximations tended to be to the nearest 15 minutes.

Results

Data from both groups, i.e. those patients subsequently shown to have myocardial infarction and those not, were analysed together because they were all considered to be suffering acute coronary occlusive episodes at the time when admission was requested.

Information for the first four intervals is summarised in figure 1 and shows a similar trend in all.

Interval (*a*). This was known for 166 admissions. The median time was 60 minutes (60 minutes by day and 90 minutes by night). In 40 instances patients informed their general practitioners within 15 minutes and in 63 within 30 minutes. In 105 of these

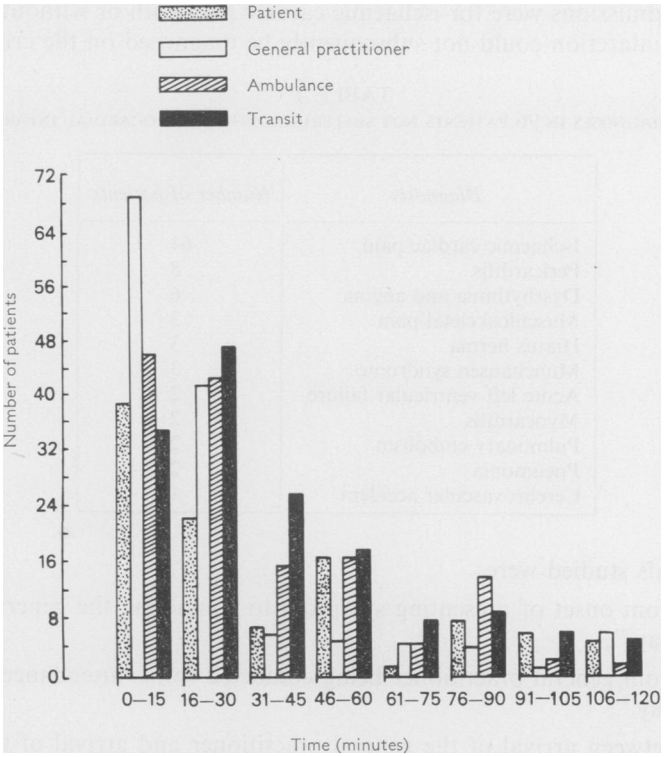

Figure 1
Analysis of respective delays in first 120 minutes.

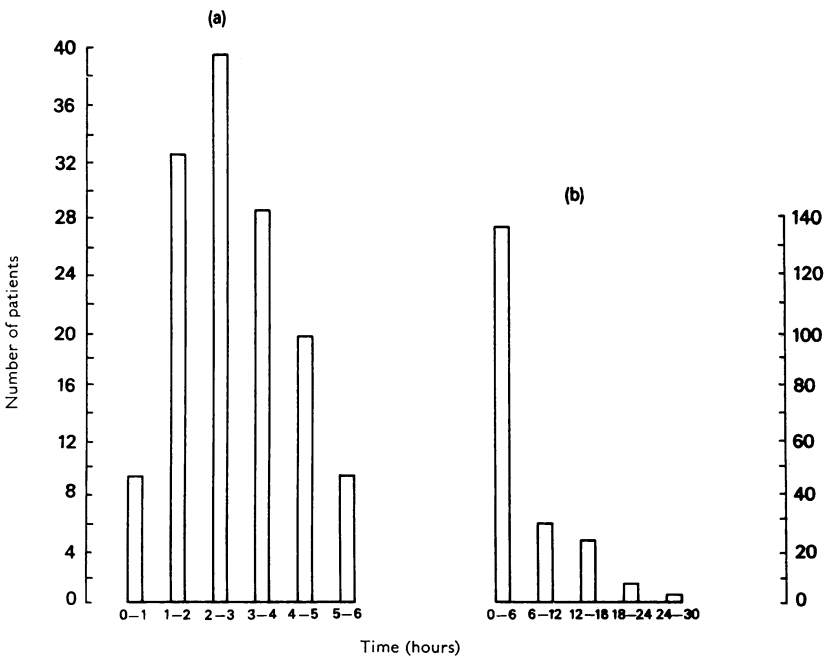

Figure 2
Analysis of total delay (a) in first 6 hours; (b) in first 30 hours.

cases, there was a definite positive or negative history of previous angina or myocardial infarction. For the 75 with a positive history, the median delay was 75 minutes; for the 30 without previous ischaemic symptoms it was 60 minutes. Though the numbers are small, those with a positive past history seemed no less likely to have suffered frank, fresh, myocardial infarction (74 per cent) than those in the other group (62 per cent).

Interval (*b*). This was known for 153 admissions, the median time being 20 minutes (25 minutes by day and 15 minutes by night). In 80 per cent of cases, patients were seen by their general practitioners within 60 minutes.

Interval (*c*). This was known for 155 admissions, the median time being 30 minutes (both by day and by night).

Interval (*d*). This was known for 157 admissions, the median time being 30 minutes (both by day and by night).

Interval (*e*). In 103 cases, patients were admitted to the unit via the admissions unit, the median time spent there being 70 minutes.

Interval (*f*). The total time interval was known for 200 admissions, the median time being 3 hours 30 minutes (3 hours 20 minutes by day and 4 hours 30 minutes by night). At one hour, only 4·5 per cent of the patients had been admitted, and at two, 21 per cent (figure 2).

Discussion

This study was undertaken in an attempt to determine the major sources of delay in the admission of patients to a coronary care unit. For the purpose of this exercise we were concerned with the delays in admission experienced by all patients sent to the unit as coronary emergencies, whether or not it was subsequently established that myocardial infarction had taken place.

The proportion of patients admitted to this unit by four hours, and the median " total delay ", compares favourably with the experience of other units without a mobile coronary care service (tables 2 and 3). However, only 4·5 per cent of our admissions were in the unit within one hour and 21 per cent by two hours. Where mobile coronary care facilities are available, 26 per cent or more of the patients can be under intensive

TABLE 2

PERCENTAGE OF PATIENTS UNDER INTENSIVE CORONARY CARE WITHIN 4–12 HOURS AFTER ONSET OF PRESENTING SYMPTOM

	Author(s)	*Number of patients*	*Per cent under care within time stated*		
			4 hours	*4–6 hours*	*6–12 hours*
Hospital coronary care unit only	Sloman (1968)	350	*25*	*18*	*20*
	Restieaux *et al.* (1967)	150	—	*28*	*30*
	Lawrie *et al.* (1967)	500	*55*	*17*	*15*
	This study	204	*54*	*14*	*15*
Mobile team	Kernohan and McGucken (1968)	146	*68*	*11*	—
	Pantridge and Geddes (1967)	312	*66*	—	—
	Walsh *et al.* (1972)	300	72*		

*Composite figure for 0–6 hours.

TABLE 3

MEDIAN " PATIENT " AND " TOTAL " DELAYS (NO MOBILE UNIT)

Author(s)	*Patient delay*	*Total delay*
McNeilly and Pemberton (1968)	1 hour 11 minutes	8 hours 16 minutes
Walsh *et al.* (1972)	4 hours	5 hours 40 minutes
Gilchrist (1971)	1 hour 30 minutes	4 hours 30 minutes
Hackett and Cassem (1969)	.....	4 hours
Shaw *et al.* (1971)	.....	4 hours
Moss and Goldstein (1970)	.....	3 hours 30 minutes
This study	1 hour	3 hours 30 minutes

medical care within one hour and about 40 per cent within two hours (Pantridge and Geddes, 1967; Walsh *et al.*, 1972).

As elsewhere, " patient delay " accounted for a substantial part of the total delay (table 3) and it occurs at the most critical phase. Patients appear more reluctant to call their general practitioners during the night, as found in Glasgow (Gilchrist, 1973), and for the whole 24-hour period less than half our patients contacted their doctors within 30 minutes. Presumably this proportion could be increased by identification and education of those at special risk.

However, a recent study has shown that patients with a past history of angina take longer to call for medical aid (Moss and Goldstein, 1970). A similar tendency is evident amongst those in this study for whom the relevant details were available. It seems possible that such patients may confuse the onset of a major ischaemic episode with simple angina, realisation of the true nature of the attack dawning later.

The median " general-practitioner delay " time was commendably short, especially at night when there are likely to be fewer conflicting demands on his services and more favourable traffic conditions. The median " ambulance delay " and " transit delay " were each 30 minutes and allow some scope for reduction. The " transit delay " here included time spent in the admissions unit, by not a few patients, although according to policy those destined for the coronary care unit should bypass this holding-point.

In order to increase the proportion of patients seen within the first hour or two after the onset of a possible major coronary attack, the number and duration of intermediate stages between presenting symptom and intensive medical care must be kept to a minimum. A mobile service called directly by the patient may be the logical solution. " Patient delay " in summoning such aid would probably remain the most critical factor, though this interval might prove to be shorter than that currently involved in calling out a general practitioner. However, general public access to such a service may seem undesirable at present, not least because of the possibility of its generating cardiac neurosis. Limited access by those known to be at special risk could, perhaps, prove acceptable; in providing it, the general practitioner would play a vital role by virtue of his knowledge of all the patient's circumstances.

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Addendum

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