

MEDICAL PRACTICE

Clinical Problems

Factors Affecting Admission to a Coronary Care Unit

IAIN C. GILCHRIST

British Medical Journal, 1971, 4, 153-156

Summary

Of 103 patients with suspected myocardial infarction admitted to an intensive care unit in a general hospital half were admitted within four and a half hours of the onset of symptoms. In general, patients who attended the casualty department were under intensive care sooner than patients who sought attention from their general practitioner before admission. Patients who were seen by a locum from the emergency treatment service at night or weekends were more likely to remain at home until seen the next day by their own general practitioner, compared with patients seen by their own general practitioner initially.

Introduction

Several studies have shown that the overall mortality in the acute stages of a myocardial infarction (within the first four weeks) may be about 40%, with half of the deaths occurring in the first few hours.¹⁻⁴ The provision of a coronary care unit can reduce the hospital case fatality rate of myocardial infarction to less than 20%⁵⁻⁷ by the prompt recognition and treatment of potentially lethal cardiac arrhythmias, which are most common in the early stages of an acute myocardial infarction. This may represent a reduction in the hospital fatality rate of about 20%;⁵ most deaths, however, occur before there is time for effective medical aid to be instituted.^{3, 9}

Reports have also been published on the causes of delay in admission to coronary care units,^{3, 4} but the effect of the self-referral of patients to hospital without sending for the general

practitioner initially has not been considered. There has also been no measurement of the effect on patients who are seen not by their own general practitioner but by a locum employed by a deputizing service or emergency treatment service (E.T.S.) as it was formerly called in Glasgow. This paper presents an analysis of the causes of delay in admission of patients to the intensive care unit at the Southern General Hospital, Glasgow.⁷

Methods

A total of 108 patients in whom a clinical diagnosis of myocardial infarction was suspected were admitted to the intensive care unit in a four-month period (21 March to 11 July 1970) and were interviewed by me as soon after admission as possible. The following details were noted for each patient: name, address, date of birth, sex, occupation, hospital unit number, date and time of onset of symptoms, time that medical aid was sought, time when the patient was first seen by a doctor, length of time the doctor was with the patient, mode of transfer to hospital, time of arrival in the hospital, time of arrival in the unit, whether the patient had a previous history of angina or a previous myocardial infarction, and the doctor or doctors who had seen the patient between the onset of symptoms and admission to the unit. This enabled doctors to be placed in one of five groups—the patient's general practitioner (or his partner or assistant), a doctor employed by the emergency treatment service, a casualty officer in the Southern General Hospital, a consultant seeing the patient on a domiciliary visit, or a works doctor. On the patient's transfer from the unit or on his death a note was made of the diagnosis reached.

Results

Of the 108 patients five were excluded from the study—two because they could not recall details of time accurately, two patients with "crescendo angina" in whom it was not possible to determine exactly when the symptoms started, and one

Department of Medicine, Southern General Hospital, Glasgow S.W.1

IAIN C. GILCHRIST, M.B., D.OBST.R.C.O.G., Vocational Trainee in General Practice

patient with a past history of angina who had "collapsed" at a time which could not be ascertained. Of the remaining 103 patients 47 were subsequently proved to have had a myocardial infarction by E.C.G. changes and by diagnostic SGOT levels. Fifty-two patients had acute myocardial ischaemia and there was one case each of pericarditis, supraventricular tachycardia, left ventricular failure with no evidence of acute myocardial infarction, and pulmonary embolism.

The median delay between the onset of symptoms and arrival in the intensive care unit for all 103 patients was 4 hours 30 minutes. The numbers of patients admitted to the unit classified by the doctor who initially saw the patient are shown in Table I. Those patients who were admitted after a domiciliary consultation are classified separately, as special circumstances

TABLE I—Patients seen by Different Categories of Doctor.

Group	Category of Doctor	No. of Patients	Mean Time from Onset of Symptoms to Admission to Intensive Care Unit
1a	General practitioner, home visit ..	40	6 hr 42 min
1b	General practitioner, at surgery ..	8	15 hr 6 min
2	Emergency treatment service doctor	15	12 hr 56 min
3	Works doctor	4	3 hr 45 min
4	Casualty officer	24	3 hr 50 min
5	Consultant, domiciliary visit ..	5	42 hr 8 min
6	Transferred from other wards ..	5	6 hr 41 min
7	Other	2*	1 hr 37 min

*Includes 1 patient admitted direct without seeing any doctor before admission, and 1 patient who was seen in a hospital corridor by a house officer and admitted to the unit without going to the casualty department.

All patients are classified by the doctor who initially attended the patient, except that the 5 patients admitted after a domiciliary visit are classified separately (2 were seen initially by an emergency treatment service doctor and 3 by their general practitioner).

might have led to a delay in diagnosis—for example, atypical presentation or delay in admission, including initial reluctance on the part of the patient to enter hospital. Patients in category 4 of Table I reach the unit by going through fewer stages than patients in categories 1a and 2 (because of the smaller numbers involved patients in categories 1b, 3, 6, and 7 are not to be considered further at this stage).

The stages that patients in the main categories pass through before admission to the intensive care unit are shown in the Diagram. Self-referred patients—that is, those in category 4—were compared with referred patients—that is, those in categories 1a and 2—by ranking them with numbers. Number 1 was allotted to the patient with the shortest overall time between the onset of symptoms and admission to the unit, number 2 to the patient with the next shortest time, and so on to number 79. The Mann-Whitney U test was then applied as a test of statistical significance to see if self-referred patients were admitted in a time significantly shorter than referred patients. This test showed that there was a statistically significant difference between the two groups ($U = 924$; $z = 2.815$; $P < 0.0025$ for a one-tailed test). When only those patients in whom a myocardial infarction was subsequently confirmed are considered there were eight patients from category 4 and 26 from categories 1a and 2, and when applying the same test of statistical significance there is again a difference between the groups ($U = 71$; $z = 1.687$; $P < 0.046$).

The Mann-Whitney U test was then applied to the scores of the ranks of the two categories of patients admitted after seeing a doctor outside the hospital according to whether the doctor was the patient's general practitioner, or his partner or assistant, or whether the doctor was employed by the emergency treatment service. To ensure comparability between these two groups only those patients who initially called their general practitioner at night (from 18.00 hours to 08.00 hours) or weekends (from 13.00 hours on Saturday to 08.00 hours on Monday) are included. Details of these patients are summarized in Table II. This ranking showed that patients initially seeing their own doctor or his partner were admitted sooner than patients who

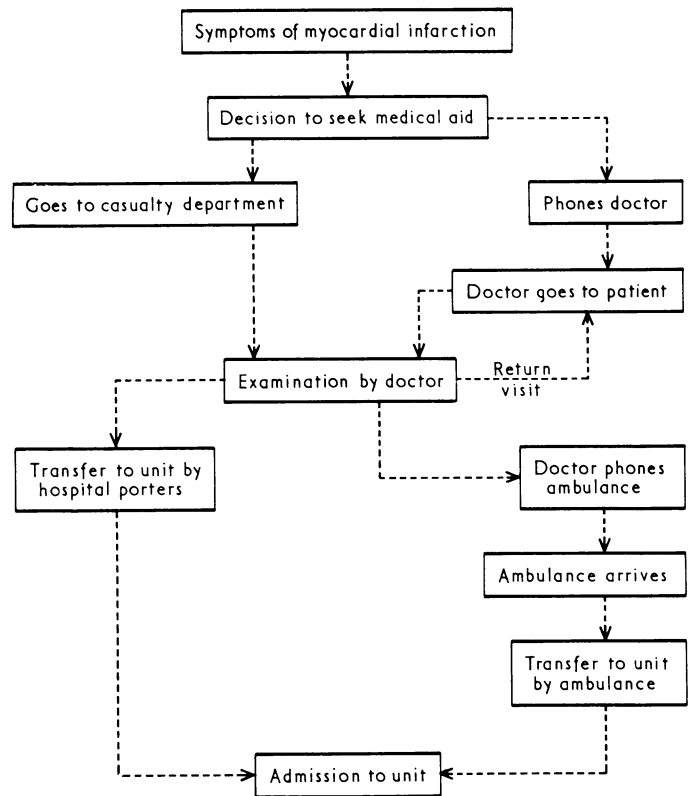


Diagram showing different paths followed by referred and self-referred patients from onset of symptoms to admission to intensive care unit.

TABLE II—Patients admitted at Night or Weekends classified by Doctor making Initial Visit

	G.P.	E.T.S. Doctor	Total
No. of patients	19	15	34
No. of patients with confirmed myocardial infarction	8	8	16
Mean time from onset to admission in patients with confirmed myocardial infarction	5 hr 24 min	10 hr 1 min	7 hr 42 min
Median time from onset to admission in patients with confirmed myocardial infarction	2 hr 52 min	8 hr 7 min	3 hr 55 min

were initially seen by an emergency treatment service doctor. This difference is statistically significant at $P < 0.05$ ($U = 94$).

A considerable cause of delay for some patients is that they are not admitted after the initial visit of the doctor, but they are admitted after a subsequent visit, usually the next day (Table III). For the ten patients admitted after subsequent visits the mean delay from the onset of symptoms to admission to the intensive care unit was 22 hours 51 minutes, and the median delay was 17 hours 47 minutes. The corresponding delay in patients who were admitted after the initial visit of a doctor is shown in Table IV; there is no statistical difference between the general practitioner and emergency treatment service groups.

Delay before Calling Doctor.—This time was noted in 59 patients in categories 1a, 2, and 5 in Table I. The mean time

TABLE III—Patients admitted after First or Subsequent Visits of Two Groups of Doctors at Night and Weekends

	Seen Initially by:	
	G.P.	E.T.S. Doctor
No. of patients admitted after first visit	16 (7)	8 (3)
No. of patients admitted after subsequent visit	3 (1)	7 (5)

$\chi^2 = 5.40$; D.F. = 1; $0.025 > P > 0.02$. The numbers of patients in whom a myocardial infarction was confirmed are given in parentheses.

TABLE IV—Comparison of Patients admitted after First Visit of General Practitioner or Emergency Treatment Service Doctor at Night and Weekends

	Admitted by:	
	G.P.	E.T.S. Doctor
No. of patients	16	8
Mean time from onset of symptoms to admission to unit	4 hr 16 min	4 hr 16 min
Median time from onset of symptoms to admission to unit	3 hr 25 min	3 hr 30 min

When the 24 patients are ranked in a Mann-Whitney U test there is no significant difference between the groups ($U = 54$).

from the onset of symptoms to sending for medical aid in these patients was 2 hours 53 minutes, and the median time was 1 hour 30 minutes. Patients were placed in three groups: (a) those patients not having previous symptoms suggestive of ischaemic heart disease; (b) those patients who had symptoms, usually angina, whether or not they had previously sought medical advice about these symptoms; and (c) those patients with a past history of myocardial infarction. The relationship between the previous history of the patient and the length of time elapsing before sending for medical aid is shown in Table V.

TABLE V—Patients classified on basis of Past History of Ischaemic Heart Disease and Speed with which Medical Aid is Sought

	No Past History	Past History of Angina	Previous M.I.
No. of patients	21	19	19
Mean time from onset of symptoms to calling doctor	3 hr 48 min	1 hr 59 min	2 hr 46 min
Median time from onset of symptoms to calling doctor	3 hr 30 min	45 min	1 hr 30 min
No. calling doctor before mean*	10	15	12
No. calling doctor after mean*	11	4	7
No. calling doctor before median†	10	11	9
No. calling doctor after median†	11	5	9

* $\chi^2 = 2.589$; D.F. = 2; not significant.

† $\chi^2 = 2.712$; D.F. = 2; not significant.

The patients with a past history of angina and those with previous myocardial infarction can be combined so that all patients with a past history of ischaemic heart disease are considered together and compared with those patients with no past history. When a χ^2 test is applied to the groups of patients obtained by using the common median time the result is not significant ($\chi^2 = 1.249$; D.F. = 1). When the common mean time is used to obtain different groups of patients the result is significant at 10% but not at 5% ($\chi^2 = 3.177$; D.F. = 1; coefficient of association = -0.459).

The median time from the onset of symptoms to calling a doctor for all patients was 1 hour 30 minutes, and the mean time for all was 2 hours 53 minutes. M.I. = Myocardial Infarction.

Ambulance and Transport Delays.—The length of time elapsing from the time that the doctor outside hospital decided to admit the patient to hospital until the time of arrival of the patient in the intensive care unit was noted in 51 patients. This was usually about 50–60 minutes (mean 1 hour 4 minutes, median 50 minutes, range 15 minutes to 5 hours 5 minutes). The mean delay in the 24 patients admitted from the casualty department from the time of arrival in the casualty department to the time of admission to the unit was 57 minutes (median delay 45 minutes, range 15 minutes to 2 hours 45 minutes.)

Discussion

In the first year of operation of the unit, of those patients admitted within 48 hours of the onset of symptoms 49.1% were admitted within four hours.⁷ This can be compared with a median delay of 4 hours 30 minutes for all patients in the present study, and accords with the experience of units elsewhere—for example, the median delay in admission to the coronary care unit at the Edinburgh Royal Infirmary for the first 1,300 patients was 4 hours 47 minutes.¹⁰ For urban communities in the United Kingdom unless special provision is made for coronary suspects—for example, a flying squad service—about half of the patients with acute myocardial infarction will not be admitted within the first few hours, when the fatality rate is highest.

Patel¹¹ reported an increase in the number of self-referred patients to a general medical unit in another hospital in Glasgow; 60% of the patients in his series were self-referred, and of these 30–35% required admission to hospital. In the present study 25% of all admissions to the intensive care unit were self-referred, a similar proportion to that of Patel's series, but no analysis of the reasons for self-referral was undertaken. Nevertheless, many of Patel's findings might be valid if applied to the present series of patients. What is clear, however, is that patients who are self-referred are admitted sooner after the onset of symptoms, and though this group may be composed of patients who are not strictly comparable to the patients in the referred groups, even when only those patients who have actually sustained a myocardial infarction are considered, there is a statistically significant difference in the time from onset to admission between the self-referred and referred groups.

Self-referral to the casualty department may be beneficial in that patients with myocardial infarction can come under intensive care more rapidly but there may also be disadvantages—for example, there might be difficulty in obtaining details of the patient's past history, and transporting patients to hospital by car, taxi, or bus may be hazardous. Some other areas have found that an organized flying squad service is able to provide intensive care in a time comparable to that achieved by the patients admitted from the casualty department.¹²

Among those patients who call for a doctor at night or weekends probably those who are seen initially by their own general practitioner are more likely to be admitted direct to the unit, whereas those who are seen by an emergency treatment service doctor are less likely to be admitted direct to the unit and have a greater chance of remaining at home and being admitted subsequently by their own doctor. The cause of this difference is not clear, and further study is required.

Various surveys^{10 13 14} have shown that the greatest cause of delay in the admission of patients to coronary care units is due to the delay between the onset of symptoms and the patient or his relatives seeking medical aid. This has been the experience in this hospital also. The data relating to past history and the speed with which medical aid is sought suggest that it might prove difficult to reduce the length of time that elapses in the early stages of a myocardial infarction before the patient calls a doctor. It has been suggested¹⁴ that patients and potential patients might be educated to take prompt action should they experience symptoms which they think might be due to a heart attack. This study shows, however, that there is little correlation between how long a patient waits before seeking medical aid and a past history of ischaemic heart disease, which presumably educates the patient about the symptoms of a heart attack.

Possibly we as doctors have gone too far in educating the public not to trouble their doctor unnecessarily, so that some patients will endure the symptoms of a myocardial infarction for some hours before sending for a doctor. A campaign to educate patients and potential patients to call their doctor as soon as possible might reduce the delay before such a patient is admitted to a coronary care unit, though it would also probably increase the number of patients admitted who had not sustained a myocardial infarction. There are also psychological and constitutional factors which cause a patient to delay before deciding to seek medical aid, and this aspect also requires further study.

Finally, there may be a place for suggesting that if a doctor believes in the benefits of a coronary care unit he should admit any patient in whom there is a clinical suspicion of myocardial infarction as soon after the onset of the attack as possible. A "wait-and-see" attitude results in a few patients being admitted after the period of maximum danger is over.

I am indebted to Dr. B. M. Groden, department of medicine, Southern General Hospital, for much helpful advice and criticism in the preparation of this paper, and to Mrs. H. MacCartney, department of statistics, University of Glasgow, for advice on statistical analysis of the data.

References

- ¹ Bainton, C. R., and Peterson, D. R., *New England Journal of Medicine*, 1963, 268, 569.
- ² Lown, B., et al., *American Journal of Cardiology*, 1967, 20, 494.
- ³ McNeilly, R. H., and Pemberton, J., *British Medical Journal*, 1968, 3, 139.
- ⁴ Fulton, M., Julian, D. G., and Oliver, M. F., *Circulation*, 1969, 40, Suppl. No. 4, p. 182.
- ⁵ Restieaux, N., et al., *Lancet*, 1967, 1, 1285.
- ⁶ Lawrie, D. M., et al., *Lancet*, 1967, 2, 109.
- ⁷ Shaw, G. B., Groden, B. M., and Hastings, E., *Scottish Medical Journal*, 1971, 16, 173.
- ⁸ Julian, D. G., Valentine, P. A., and Miller, G. G., *American Journal of Medicine*, 1964, 37, 915.
- ⁹ Kuller, L., Lilienfeld, A., and Fisher, R., *Circulation*, 1966, 34, 1056.
- ¹⁰ Gambier, D. M., *Journal of the Royal College of General Practitioners*, 1970, 20, 153.
- ¹¹ Patel, A. R., *British Medical Journal*, 1971, 1, 281.
- ¹² Pantridge, F., in *Acute Myocardial Infarction*, ed. D. G. Julian and M. F. Oliver, Edinburgh, Livingstone, 1968.
- ¹³ Oliver, M. F., *Journal of the Royal College of Physicians of London*, 1968, 3, 47.
- ¹⁴ Bethesda Conference Report, *American Journal of Cardiology*, 1969, 23, 603.

Contemporary Themes

Survey of 3,000 Unwanted Pregnancies

JOAN LAMBERT

British Medical Journal, 1971, 4, 156-160

Summary

A survey of 3,000 unwanted pregnancies disclosed two main populations differing in age, marital status, and contraceptive practice. Failure to use contraception accounted for two-thirds of the pregnancies. More than half of the patients were married women or single women in stable relationships, but many single women faced their predicament alone, without help from partner or parent.

Some evidence is given of valid needs which could not be met by existing N.H.S. facilities.

Introduction

A survey was made of 3,000 consecutive patients who came to the Pregnancy Advisory Service during the year November 1968 to November 1969. The service is a registered charity which opened in London in November 1968 with the aim of giving sympathetic advice and help to women with unwanted pregnancies. Patients discuss their problem with an experienced social worker and are then seen by one of a number of doctors employed by the service on a sessional basis. These doctors are usually general practitioners or those experienced in family planning or marriage guidance. Those patients thought to have grounds for termination of pregnancy are then referred to gynaecologists, who make their own assessment and arrangements for treatment. Patients who decide to keep their babies are put in touch with the person or organization who will give support during and after the pregnancy. As many patients as possible from the London area are seen by the social worker for follow-up interviews.

Method

Research and collection of data were among the original aims of the service. Careful records are kept of all patients who have

come for advice. A questionnaire is completed by the staff, which serves as both a medical and a social case history, and is sent to each of the doctors the patient consults. Part 1, completed by the social worker, includes the patient's age, birth order in the family and number of siblings, marital status, social class, religion, nationality, ethnic group, the area in which she lives (given in regional hospital board areas), and by whom she was referred to the service. If single she is asked whether she lives with her parents and whether they know about her pregnancy. Information about her partner states how long he has known her and his nationality, status, and attitude to the pregnancy. The patient's contact with her general practitioner is recorded, whether she consulted him about this pregnancy, whether he sent her to a N.H.S. gynaecologist or other specialist, whether he signed certificate A, and whether he subsequently sent her to the advisory service.

Part 2 of the notes, for the doctor's use, compiles a gynaecological history, including the date of her menarche, information about the pregnancy test, date of her last menstruation, and the doctor's estimate of the gestation period. The number and outcome of previous pregnancies are noted. The patient is asked about her regular use of contraceptives and the method in use on the occasion on which this conception was thought to have occurred. If the patient is thought to have legal grounds for termination the doctor records the clause(s) of the Abortion Act under which he recommends an abortion.

Part 3 is completed by the gynaecologist or other specialist to whom the patient may be referred or by the office staff if she is not referred. Elements were coded from completed case histories. From these anonymous coding sheets London University Computing Services punched 80-line cards. The data were analysed by using the M.V.C. programme of the Atlas computer.

Results

SOURCE OF PATIENTS

Patients came from all over the British Isles, most (72%) from London and the Home Counties. Foreign girls not domiciled in Britain were not seen, as they were not registered with a general practitioner and because language difficulties would have made proper assessment impracticable. Altogether 1,319 (44%) patients were sent to the advisory service by their

London S.W.14.

JOAN LAMBERT, Housewife, London