Occasional Survey

Follow-up of Emergency Ambulance calls in Nottingham: Implications for Coronary Ambulance Service

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Summary

Information about patients in ambulance service records has been linked to that in the patients' hospital records in an attempt to make the most efficient use of a special ambulance service for patients suspected of having heart attacks. During one week 248 emergency (999) calls for an ambulance were made by the public in the city of Nottingham. The quality of information given to the ambulance centre was poor, and all four patients eventually found to have had a myocardial infarction were described as having collapsed. A further study of patients who were also described as having collapsed has led to a system which allows an ambulance controller to send a "coronary ambulance" only in answer to those emergency calls where there is a reasonable possibility that the patient has had a heart attack.

Introduction

Since most people who die of a heart attack do so within a few hours of the onset of symptoms an ambulance must reach the patient with the least possible delay, and it has been claimed¹ that a specially equipped and manned "coronary ambulance" can reduce considerably the mortality from heart attacks. Ideally, emergency calls for a coronary ambulance should be accepted from members of the public as well as from medical practitioners, but some screening of 999 calls is obviously required if the ambulance is not to be despatched to patients with illnesses other than possible heart attacks. We describe here a linkage of ambulance and hospital records made in an attempt to solve this problem in Nottingham before beginning our own coronary ambulance service.

Method

Emergency ambulance calls made by members of the public in the city of Nottingham are received by a single telephone operator. He obtains such information as he can from the caller and completes a form including a section marked "diagnosis," usually using the words of the caller. He passes this form to the controller who despatches an appropriate vehicle.

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In the first week of the study all the telephone operators' forms were collected and the patients were identified from the forms completed by the ambulance crews and the casualty register in the accident and emergency department of Nottingham General Hospital, which serves the whole of the city of Nottingham. Information concerning the patients was obtained as appropriate from the accident department records, the hospital notes, or from coroner's records.

In the next three weeks of the study information was obtained only about those patients who were described as having collapsed. During this period the ambulance telephone operator asked the caller if the patient had had chest pain before or at the time of the collapse, and he then recorded it as present, absent, or unknown. Clinical information was then collected about each patient whose record was so marked. When such patients were sent home after assessment in the accident and emergency department an attempt was made to ensure that a heart attack had not in fact been the cause of the collapse. Unless the patient had clearly been drunk and incapable he was sent an outpatient appointment for one month after the "collapse" and at this visit he was clinically and electrocardiographically assessed. Patients failing to attend were sent a second appointment together with a card for them to complete and return if they were well and did not wish to come to hospital.

Results

ANALYSIS OF ALL EMERGENCY CALLS IN ONE WEEK

During the first week of the study 248 emergency calls for an ambulance were made by the public. Trauma (mainly road traffic accidents) accounted for 90 of these calls, and the nature of the problem was easily identified by the ambulance telephone operators. There were 54 calls for attention to children under the age of 14. Identifiable illnesses which were not cardiac accounted for eight calls, and in four cases the caller said that the patient was dead. There were seven cases of self-poisoning and four patients were drunk and incapable. In 81 cases (32%) the telephone operator had no indication of the possible diagnosis: 38 patients (15%) were said to have collapsed, no information was available whatsoever in 38 cases, and five patients were described as having a "sudden illness". There were no calls specifically because of chest pain or heart attack.

Of the 38 cases where no information at all was given by the caller most were accidents (16 cases). Of the remainder four patients were eventually shown to have had abdominal problems, three had epilepsy, three were maternity problems, two had a gastrointestinal haemorrhage, one was found dead by the ambulance crew, and the remainder had other non-cardiac problems. Of the five patients described as having a "sudden illness," two had abdominal pain, one had acute urinary retention, one had a cerebrovascular accident, and in one no abnormality was found.

TABLE I—*Diagnoses in Patients described as having Collapsed during First Week of Study*

Cardiovascular other than myocardial infarction	..	..	..	..	5
Drunk and incapable	..	..	..	..	5
Simple faints	..	..	..	..	5
Myocardial infarction	..	..	..	..	4
No abnormality found	..	..	..	..	4
Respiratory illness	..	..	..	..	2
Self-poisoning	..	..	..	..	2
Cerebrovascular disease	..	..	..	..	2
Other diagnoses and refused ambulance	..	..	..	..	7
Total	..	..	..	..	38

The diagnoses eventually made in the 38 patients described as having collapsed are shown in table I. Four were found to have had myocardial infarctions, and five more had other cardiac problems. Thus, of the 248 emergency calls made during the week all four patients who had myocardial infarctions were reported as having collapsed. We therefore decided to study in detail the outcome in a further group of patients suffering from a collapse.

STUDY OF PATIENTS WHO COLLAPSED

During the three-week survey there were 115 emergency calls by members of the public for patients who were said to have collapsed. These patients comprised 10% of the 1,144 emergency calls during this period. The eventual management of these 115 patients is shown in table II. Of the 39 patients who

TABLE II—*Eventual Management of 115 Patients with Collapse during Three-week Study according to Presence or Absence of Chest Pain*

	Chest Pain		
	Present	Absent	Unknown
Dead on arrival	6	1	16
Admitted	22	1	20
Sent home	11	10	28
Total	39	12	64

TABLE III—*Main Diagnosis in 43 Patients who had collapsed and were admitted to Hospital*

	Chest Pain		
	Present	Absent	Unknown
Myocardial infarction	16		1
Arrhythmia			1
Heart failure	2		
Respiratory illness	1	1	1
Stroke	1		4
Epilepsy	1		3
Other	1		10
Total	22	1	20

were said to have had chest pain 11 were considered well enough to be sent home whereas 10 of the 12 without pain were sent home from the accident department. The principal diagnoses of the patients who were admitted are shown in table III; there was only one patient who had collapsed because of a myocardial infarction about whom no story of chest pain had been obtained.

Coroner's post-mortem examinations were carried out on 21 of the 23 patients who were found dead on arrival at hospital. In 15 the cause of death was recorded as myocardial infarction or coronary artery occlusion. In one the myocardium had ruptured owing to myocardial degeneration, and in two death was recorded as due to myocardial degeneration. The patient who had been reported to the ambulance station as not having

chest pain and who was found dead on arrival in hospital had pneumonia.

Thus, of the 115 patients initially described as having collapsed 35 either needed admission because of a myocardial infarction or died from a cardiac abnormality. Of these patients 22 were described to the ambulance telephone operator as having chest pain, and in 13 cases the caller did not know whether pain was present or not. There were no patients with myocardial infarctions who were definitely stated not to have chest pain. Of those patients who were said to have chest pain at the time of their collapse but who were sent home some were found to have had abdominal pain and the others had a variety of unimportant conditions. Follow-up one month after the collapse did not suggest that any of these patients had had a heart attack which had not been diagnosed in the accident department.

INITIAL EXPERIENCE WITH CORONARY AMBULANCE

Since the inception of our Coronary Ambulance Service the special vehicle has been dispatched at the request of general practitioners and in response to emergency calls for patients said to have collapsed, provided chest pain is not known to be absent.

Of the first 200 patients brought to hospital by the Nottingham coronary ambulance 54 were found to have had a myocardial infarction. Of the 82 calls made specifically for this ambulance by general practitioners 27 (33%) were for patients eventually diagnosed as having a myocardial infarction. The other 118 calls were selected as possible cases of myocardial infarction by the ambulance telephone operators from the emergency calls made by members of the public, and in 27 cases (23%) the telephone operators correctly identified a myocardial infarction.

Though only 27 of the 118 selected calls from the general public involved patients with myocardial infarctions it was these patients who were reached most quickly after the onset of their symptoms, and who therefore had the greatest chance of benefiting from the service. Fifteen of these 27 patients had had symptoms for less than 30 minutes compared with only two of the 27 patients with a myocardial infarction for whom the call was made by a general practitioner.

Discussion

This survey showed clearly the poor quality of information given by members of the public who make emergency calls for an ambulance. It was particularly striking that in 15% of calls no information whatsoever about the nature of the emergency was provided. Either the call was made by a third party at the request of someone involved with the patient or the caller said that he "did not want to get involved."

If a special ambulance service is to lead to a significant reduction of the mortality from a heart attack it must reach the patient soon after the onset of symptoms, which implies that calls for the service should be accepted direct from members of the public. During the four weeks of our survey just under 3% of all emergency calls were for patients who were eventually found to have had heart attacks, and it would obviously be difficult and unnecessarily time-consuming for the ambulance telephone operator to obtain anything resembling a useful medical history before deciding which ambulance to despatch to the call. It is equally unrealistic to suppose that a coronary ambulance with an adequately trained crew can be despatched to all emergency calls even if no attempt is made to send medical staff. The existing special services all apparently restrict their ambulances to calls made by general practitioners or to cases where there is some special reason for the telephone operator to believe that a heart attack has occurred.¹⁻⁵

COLLAPSE AND CORONARY ATTACKS

The use of the word "collapse" may perhaps be a regional phe-

nomenon but at least in Nottingham it seems to encompass heart attacks in the lay mind. Our study suggests that there is no point in sending a coronary ambulance in response to an emergency call for a patient with anything other than a collapse, and if the telephone operator can elicit a history with an absence of chest pain it looks as if it will be unprofitable to despatch the special vehicle.

Initial experience suggests that our method of identifying patients with heart attacks from emergency calls made by members of the public is working reasonably well. As it is virtually only such calls that involve patients with symptoms for a very short period we believe it is particularly important to use our special vehicle in this way.

Possibly a call-selection system might be further refined if the general public were educated about the symptoms of heart attacks and the need for urgent treatment, but any educational programme would probably increase the number of calls (both genuine and false) for the ambulance and the service might well become swamped. We do not believe that the value of a coronary

ambulance service is yet sufficiently well established to justify a programme of mass education.

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Effects of Ambulance Transport in Critically Ill Patients

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Summary

Two groups of critically ill patients were transferred by ambulance from other hospitals to a central intensive therapy unit. The effect of transport was reviewed retrospectively in 46 patients and prospectively in 20 patients. Of the 46 patients reviewed retrospectively six became hypotensive, six became hypertensive, and seven developed delayed hypotension. One patient developed fits and six out of 13 patients had a rise in arterial PCO_2 of 1.6-4.1 kPa (12-31 mm Hg).

Of the 20 patients reviewed prospectively, one patient became hypertensive due to overtransfusion, one had a fit, but none became hypotensive. Three out of four cases of delayed hypotension were related to starting intermittent positive pressure ventilation. Arterial PCO_2 fell in one patient and arterial PCO_2 rose in two, each change being related to changed oxygen therapy or narcotics. There were no changes in other cardiovascular or respiratory indices, body temperature, or urine production.

Earlier transfer, resuscitation before transfer, continuing medical care during the journey, and hence a slower smoother journey seemed to be important factors in the management of these patients. Our findings may have important implications in the future regional organization of the care of critically ill patients.

Introduction

With categorization of hospitals and increasing specialization

transfer of critically ill patients between hospitals is likely to become more frequent. Thus detailed knowledge of the effects of transport is essential.

Most previous studies have dealt with primary evacuation of patients in an unstable condition from roadside or home.¹⁻³ Isolated instances of collapse seem to have been related to sudden jolting of the ambulance,^{2 4 5} but the lack of any pre-transfer baseline data makes conclusions difficult. Secondary evacuation between hospitals of selected groups of ill patients is reported in several French studies.⁶⁻¹⁰ Serious collapse, arrhythmias, cardiac arrest, acute respiratory insufficiency, or fits occurred in 5% of such patients, and 15-30% developed mild hypotension. These reports, however, were generally retrospective clinical studies and gave few objective data.

Retrospective Review

In six years 67 patients were transferred by ambulance from other hospitals to the intensive therapy unit of the Western Infirmary, Glasgow. Adequate records were available on 46.

The primary clinical conditions for which transfer was deemed necessary are indicated in table I. Though there were no statistically significant changes in mean heart rate or systolic blood pressure as a result of the journey considerable variation in haemodynamic response occurred from patient to patient. Twenty-seven patients had no change in heart rate or systolic blood pressure. In six patients a raised systolic blood pressure of 30-50 mm Hg occurred which settled spontaneously in two to four hours (fig. 1). In six patients a fall in blood pressure of more than 40 mm Hg occurred. Since urgent treatment was required to correct this hypotension spontaneous recovery could not be assessed (fig. 2). A delayed fall in systolic blood pressure of 20-30 mm Hg occurred one to one and a half hours after transfer in seven patients (fig. 3), possibly related to a change in treatment after arrival at the intensive therapy unit. One previously stable patient developed fits and tachycardia 14 minutes after the journey. The distribution of these patterns of response within the series is shown in table I. Septic shock seemed particularly likely to be associated with either hypertension or hypotension, and patients with chest injuries seemed more likely to develop hypertension.

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