Coronary patient—early treatment

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"There are some 150 000 deaths from coronary heart disease in the United Kingdom each year; 55 000 of these occur in people aged less than 70 years; approximately two-thirds take place outside hospital. The majority are sudden in that they occur within an hour of the onset of symptoms." While there can be no disagreement with the opening sentence of a recent *British Heart Journal* Editorial,¹ its concluding sentence must be viewed with caution: "The negative attitude of the DHSS towards emergency coronary care in the United Kingdom continues (although) . . . 7500 lives might be saved annually."

In 1975 a working party of the British Cardiac Society and the Royal College of Physicians² recommended that the DHSS should actively encourage the development of doctor-manned mobile coronary care units and suggested that all patients with suspected myocardial infarction should be transported by them to hospital coronary care units. The ensuing five years have seen little change in the pattern of management of such patients in the United Kingdom: is the DHSS really causing thousands of unnecessary deaths by dragging its feet?¹³ Unfortunately it is by no means certain that, given the present pattern of medical care in the United Kingdom, the active promotion of doctor-manned mobile coronary care units would have a noticeable impact on the community mortality from myocardial infarction.

Seattle emergency service

The most highly developed system of prehospital care for patients with emergency illnesses is that in Seattle, USA, where approximately 100 patients who suffer a cardiac arrest outside hospital are successfully resuscitated each year.⁴ This is the yardstick against which all prehospital care systems must be measured, and its organisation is worth considering in some detail. Before the introduction of the present system, the emergency ambulance service in Seattle was extremely poor, and there was not even an emergency telephone number.

Because it was difficult to improve the existing ambulance service the "rescue" activities of the fire service were developed instead. By its nature, a fire service has no routine commitments, and because fire stations were already liberally scattered throughout Seattle the fire department was an ideal base upon which to build up an emergency medical service. An added advantage was that the whole of the city of Seattle was covered by a single fire department control room. In the USA there is no National, or even State, system of emergency medical transport, so the city of Seattle was able to develop the system most suited to its needs without having to consider the effects the new scheme might have on other parts of the country. The city voted sufficient tax resources considerably to increase the establishment of the fire service; this was necessary not only to provide the crews for the new mobile units but also to cover the 1600 hours of training each "paramedic" receives. Approximately one-third of the adult population of Seattle has been trained in cardiopulmonary resuscitation; this undoubtedly increases the efficacy of the whole service.⁵ Perhaps more important, however, the existence of cardiopulmonary resuscitation training in a population that was already extremely health conscious has led to early and accurate reporting of emergency medical problems to the control centre; since there are no general practitioners this is perhaps the obvious thing for the Seattle population to do. The Seattle paramedics are trained to handle all medical emergencies and not just those associated with heart attacks; they can, for example, after checking by radio with a hospital doctor administer any of the 40 drugs they carry. The practical skills of these paramedics in dealing with medical emergencies is probably superior to that of most British medical registrars.

Clearly in the United Kingdom we start from a very different baseline. The British are not as health conscious as their American counterparts. In most parts of the country we have a highly developed system of general practice, and everyone is meant to have a general practitioner to whom he can turn when ill. We

have a unified ambulance service which has done all that has been asked of it, but which is not geared to the extremely rapid response with paramedics that characterises the Seattle service.

Behaviour of patients

There are probably pronounced regional differences in the action taken by patients, or their relatives, when an emergency occurs. In rural areas patients mainly call for help from their general practitioners, while in urban areas, and particularly in inner cities where general practice tends to be less developed, patients may be more likely to dial "999" for an emergency ambulance. When such an ambulance is summoned the quality of information given to the ambulance controller can be very poor,⁶ so that the controller frequently has little idea of the nature of the emergency. Unfortunately, no intervention study of any form of management of patients with heart attacks has ever been conducted in association with a "coronary register", and in this country such observational registers have concerned inner city areas⁷; we therefore do not know precisely what most people do when symptoms suggestive of a heart attack occur.

A survey of 1250 consecutive patients with heart attacks who reached hospital in Nottingham⁸ showed that 657 (53%) had summoned a general practitioner in the first instance, while the remainder dialled "999" for an ambulance. Those who were away from home naturally tended to call for an ambulance, and it was this group of patients who called for help soon after the onset of symptoms. It is this division between calls to general practitioners and direct calls for an ambulance that must govern the design of an appropriate service to patients with heart attacks. For people who call an ambulance direct, hospital admission is inevitable; since it tends to be these patients who are in the early stages of their illness, some form of special ambulance service seems appropriate for them. Patients who call their general practitioner have usually survived the period of greatest risk, and it is for this group that home care is an option.

To educate the public to bypass their general practitioners if they think they have had a heart attack might undermine the vitally important relation between patient and general practitioner. We have studied this problem in Nottingham in co-operation with a group of general practitioners, who agreed that their patients should be sent a letter asking them to dial a special hospital telephone number if they had symptoms suggesting a heart attack. This provided a direct link to our coronary care unit, so that an ambulance estate car fully equipped for the management of cardiac emergencies, manned by a medical senior house officer and a coronary care unit nurse, could immediately be despatched to

the patient's home. The results of this study will be published in due course.

Behaviour of general practitioners—home or hospital?

If a patient has a heart attack at home and calls his general practitioner, the general practitioner has to decide whether to expose his patient to the rigours of an ambulance journey and hospital admission, or whether to care for him at home. The two randomised trials of home versus hospital care,^{9,10} and one survey,¹¹ suggest that if the patients with obvious complications are selected for hospital admission, there is little to choose between home and hospital care for the remainder.

Operational or management studies should be conducted with the same strict criteria required in drug trials, but they are considerably more difficult to design and conduct. Unfortunately, none of the home versus hospital studies produced an unequivocal answer. The Teeside study¹¹ was a survey, not a trial. The Bristol study⁹ involved very large numbers of general practitioners and incurred some of the problems inevitable in multicentre trials: there was a low randomisation rate and the overall mortality was low so clearly a highly selected group of patients was involved. The Nottingham study¹⁰ avoided this problem by using a hospital-based team to visit patients and to perform random allocation, but of course the fact that this team provided coronary care at home for two hours before randomisation meant that it was not a simple "home versus hospital" trial.

A common problem after the publication of any study is that both supporters and detractors tend to make unjustified extrapolations from the results. The result of a study only applies to the randomised groups, and hence the importance of knowing the population from which those groups were selected. In none of the home studies was this population known for certain, and in the case of the Nottingham study inaccurate calculations have been published by critics on a mistaken assumption of population at risk.^{3,12}

In neither the Bristol nor the Nottingham study was the size of the randomised groups anything like large enough to detect small differences in outcome between the groups of patients allocated to home or hospital treatment; this reflects the extreme difficulty of community studies. The Nottingham study was published after 500 calls had been answered over a period of nearly four years. Only 349 of these calls involved patients who might have been considered for the trial, and among the 151 inappropriate calls were nine patients who were dead when the team arrived. The study has improperly been criticised³ because of these deaths, which appeared in the report since the team had been asked to help with emergencies like drowning

when it was known that they were equipped to do so. Of the five deaths among "appropriate" patients before the arrival of the team, only two occurred in patients with relatively short histories, and only in these might a Seattle-type service have helped.¹² The Nottingham study can thus withstand most of its critics.

One of the curious features in the Nottingham study was that while most of the deaths in the "home" group occurred early, in the hospital group they mainly occurred late (that is up to six weeks after randomisation). No routine prophylactic antiarrhythmic treatment was given to either group, but there were no "early" cardiac arrests among the hospital patients. It is impossible to say whether this reflects anything more than the difficulty of interpreting results from small numbers of patients.

It seems that hospital admission can, at best, only make a small contribution to the welfare of those patients who have heart attacks at home, who call a general practitioner, and who at the time the general practitioner sees them look well enough for home care to be considered. To mount a trial to show whether such a benefit really exists would require enormous numbers of patients, and it is unlikely that it will ever be done. While such patients are, for both medical and social reasons, clearly in a minority the group is large nationally and home care would represent a considerable saving of resources. Just how many patients with heart attacks are at present cared for at home by general practitioners is unknown: the number could be increasing if general practitioners are accepting the concept of home care, or decreasing if patients are tending to summon emergency ambulances rather than general practitioners.

If a general practitioner is called to a patient who has apparently had a heart attack at home, the most important thing for him to do is to relieve pain. If, as is often the case, the patient has had symptoms for more than three or four hours, or if admission to hospital would involve a long ambulance journey, the general practitioner is entirely justified if he opts for home care.

Ambulance service

The joint working party of 1975² recommended the nationwide establishment of doctor-manned mobile coronary care units, the implication being that each city or area should have one or two special vehicles for the transport of patients with heart attacks. This is the antithesis of the Seattle system, which cares for coronary patients within a total emergency service staffed by paramedics. In the United Kingdom the Belfast service includes doctors¹³ while the Brighton service¹⁴ uses specially trained ambulance personnel, and only in Nottingham¹⁵ has a comparison been made between the two. We found that the presence of a doctor did not

improve the results obtained by the trained ambulance crews on their own, so on these and financial grounds we can assume that the future lies with "paramedics" rather than with doctors on ambulances.

No detailed reports from Belfast have been published for several years, but both the Brighton and Nottingham schemes have achieved limited success: at a comparable time, these two were producing similar results if calculations were made on a "vehicles available per month" basis.¹⁵ Only in Nottingham, however, has any attempt been made to subject the mobile coronary care unit to randomised clinical trials. These trials proved to have considerable organisational difficulties, but important lessons were learned.

In our first randomised trial¹⁶ the ambulance controllers despatched the mobile coronary care unit to patients they thought might have had a heart attack. Though the fatality rate of patients carried by the mobile coronary care unit was lower than that of patients carried by routine vehicles, the benefit was spurious because it was found that the former had unintentionally been used for low risk cases. In an attempt to restrict the use of the mobile coronary care unit to patients with heart attacks the ambulance controllers had tended to send it in response to calls from general practitioners rather than to "999" calls. Thus the patients transported by it tended to be those who had had their symptoms for a relatively long time, and had survived the period of greatest risk. The patients who dialled "999" tended to be those with short histories, who were thus at greater risk, but these patients were mainly carried by routine ambulances. In the second randomised trial¹⁷ the mobile coronary care unit was restricted to "999" calls, and because patients with heart attacks could not easily be identified from such calls the mobile coronary care unit or a routine vehicle was randomly sent to all emergency calls other than those involving road traffic accidents or children. It was found that patients with heart attacks constituted less than 5% of such cases; in the small numbers of heart attack patients that were carried during this study the mobile coronary care unit conferred no detectable advantage.

The Nottingham study therefore demonstrated only too clearly the mobile coronary care unit paradox. If a patient can be identified as having had a heart attack—usually because a general practitioner is involved who can give adequate information to the ambulance controller—then a mobile coronary care unit is unnecessary, because the patient has had symptoms for a relatively long period and has a low risk of prehospital death. Mobile coronary care units are needed for patients with heart attacks who summon an emergency ambulance because they have short histories, but among the many "999" calls handled by ambulance controllers there are relatively few concerned with

patients with heart attacks and these often cannot be identified. Nevertheless, the Seattle experience shows that it is possible to save a reasonable number of lives, so how can we organise a service as good as that in Seattle?

The mobile coronary care unit envisaged by the joint working party report² is a dinosaur; progress cannot be made on the basis of single special vehicles, whether manned by doctors or paramedics, and it was for this reason that the experimental Nottingham mobile coronary care unit service was discontinued. If worthwhile numbers of lives are to be saved we need a complete restructuring of the ambulance service with "emergency" and "routine" tiers, so that all emergency vehicles carry a defibrillator as part of their standard equipment.

The major problem in such "tiering" of the service is the need to acknowledge that 90% of the work done by the ambulance service is no more life-saving than is that of a good bus or taxi service. The transport of patients to hospital out-patient clinics, to physiotherapy departments, and to day centres is important, but the equipment and personnel needed for such a service are clearly quite different from those of an emergency service. Computerisation of routine ambulance work effectively separates off the emergency functions, and thus goes a long way towards tiering. The next step is to ensure advanced training for all ambulance crews who man the emergency vehicles.

There are no medical or technical problems to a reorganisation of the ambulance service, and the formation of the Association of Emergency Medical Technicians indicated a desire on the part of ambulance crews for advanced training. Reorganisation, however, would be fraught with political, logistic, and presumably financial problems, and before such changes are introduced nationally it would seem prudent for the DHSS to encourage a pilot scheme in a limited area to identify problems and assess benefits. There is undoubtedly room to improve the prehospital management of patients with heart attacks in the United Kingdom, but it is important that we do not introduce a new service without being sure that it is appropriate to our needs.

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