activities that can be expected to be of appreciable net benefit to the population to which they are offered. Screening procedures in particular need to satisfy many criteria before being introduced.⁴ Deciding whether to offer a procedure to patients only when they consult for other reasons or to invite them to attend specially may also be difficult. GPs therefore need to keep abreast of published work on the benefits, risks, and costs of the preventive and screening procedures with which they are concerned. They cannot rely on personal experience alone since this will hardly ever yield enough data to be conclusive. There is a place, however, for within-practice assessments of preventive measures, such as studies by questionnaire of patients' smoking habits before and after an antismoking initiative. Furthermore, population-oriented practice heightens the need for GPs to computerise their records of patient contacts so that these can be used efficiently to detect variations in morbidity owing to environmental hazards and to identify patients who are due for preventive or screening procedures.

Conclusions

The government's consultative document on primary health care suggests introducing a good practice allowance for GPs who provide effective preventive and screening services and satisfy other criteria.⁵

This might encourage GPs to treat their patients as populations, especially if suitable computer systems and training in using them are also provided.

The government may not be able to do as much to promote the treatment of patients as individuals. GPs might have more time to give to each patient if list sizes were further restricted and primary care teams expanded. Adding social workers and others with counselling skills to primary care teams would also encourage GPs to refer patients to such workers. More importantly, entrants to the medical profession should be selected for compassion as well as intellect and be encouraged to treat patients as people by the example of the clinicians on whom they model themselves. "If I know all mysteries and all knowledge but have not love, I am nothing."⁶

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Practice Research

One thousand heart attacks in Grampian: the place of cardiopulmonary resuscitation in general practice

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Abstract

The outcome of 1011 heart attacks in patients under the care of general practitioners who practised cardiopulmonary resuscitation and were equipped with defibrillators is reported. The 28 day mortality was 36% (367 patients), and 59% of deaths occurred outside hospital. The general practitioner was the first medical contact in 92% of heart attacks and was equipped with a defibrillator in 80% of such calls. Fifty six patients had a cardiac arrest in the presence of a general practitioner, and resuscitation was attempted in 47 cases, representing 5% of all calls for heart attacks. Twenty one (45%) resuscitated patients reached hospital alive, and 13 (28%) survived to leave hospital.

The opportunities for cardiopulmonary resuscitation in

general practice occur sufficiently often to warrant training and equipping general practitioners for advanced life support. The results of resuscitation by general practitioners working alone compare favourably with those of mobile coronary care units based in hospitals.

Introduction

About two thirds of the deaths that follow a heart attack take place out of hospital.^{1,2} Many are sudden, occurring within an hour of the onset of symptoms, and are due to ventricular fibrillation.⁴ The median delay in reaching a hospital coronary care unit is two to four hours,^{5,6} so these units are treating the survivors—that is, those who have not succumbed to ventricular fibrillation soon after the onset of the attack. Portable defibrillators for use out of hospital have been available since 1966, and the three year survival rate after successful resuscitation from primary ventricular fibrillation is 80%.⁷ With few notable exceptions, however, the development of mobile coronary care has not occurred generally in Britain.⁸ Is there another way of bringing patients under coronary care soon after the onset of symptoms?

In Aberdeen, in contrast with many other cities, most heart attack victims who are admitted to hospital are referred by their general practitioners, their first medical contact.⁹ We have therefore been studying the value of equipping general practitioners with defibrillators.

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lators and encouraging them to undertake advanced life support. We report the outcome of 1011 heart attacks occurring in practices so provided.

Methods

The first practice was equipped with a defibrillator in March 1980. Between then and October 1985 a further 10 practices entered the scheme, bringing the total population under study to about 82 000. Of 11 practices studied, four are in the city of Aberdeen, two are in suburbs, and five are in small country towns in Grampian.

Group practices with an appropriate organisation were selected mainly because of their interest in providing early coronary care. Each practice had one doctor on duty every day for emergency calls, who carried a radiopager and had the defibrillator in the car. The 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, including sudden deaths and heart attacks in which general practitioners were not initially concerned. A record was kept of patient and doctor delay times and the availability and use of defibrillators.

EQUIPMENT AND TRAINING

Two defibrillators were initially provided from equipment funds of the university department of medicine, and the coronary care unit, Aberdeen Royal Infirmary. Subsequent defibrillators were largely funded by the generosity of Tenovus, the Rotary Club, and local subscriptions, and from contributions from the recipient general practices. The choice of equipment was left to the general practitioners and ranged from a basic Pantridge type defibrillator to a defibrillator with monitor to a combined defibrillator, monitor, and electrocardiograph. The equipment was maintained by the department of medical physics, University of Aberdeen.

When the defibrillators were commissioned familiarisation with them and practice in their use was carried out on general practice premises using a Hewlett Packard torso and arrhythmia simulator. In some cases tutorials were given on other aspects of resuscitation and the management of myocardial infarction.

DEFINITION OF HEART ATTACK

We use "heart attack" to mean a myocardial infarction diagnosed at any of four levels of certainty. We used the following definitions, adapted from the World Health Organisation.¹⁰ The percentages of all heart attacks in four diagnostic categories are in parentheses. (i) *Definite myocardial infarction* (54%)—A history of characteristic chest pain lasting at least 20 minutes, plus either an electrocardiogram showing infarction or a rise of cardiac enzymes; or unequivocal serial electrocardiographic changes of infarction; or evidence at necropsy of recent myocardial infarction. (ii) *Probable myocardial infarction* (32%)—A characteristic history but no electrocardiographic or enzyme confirmation; or evidence at necropsy of coronary disease. (iii) *Possible myocardial infarction* (10%)—Sudden death with either a history suggesting a recent myocardial infarction or a past history of ischaemic heart disease. (iv) *Certificate myocardial infarction* (4%)—Death certificate diagnosis, none of above diagnostic evidence, no evidence for an alternative diagnosis.

Results

Of 1011 patients with heart attacks, 58% (586) were men and 42% (425) were women; there was no sex difference in the 28 day mortality. Fifty nine per cent (596) of patients were aged over 65 and had a mortality of 45%; 41% (415) were 65 or under and their mortality rate was 24%. The mean age of those who died was 72, whereas it was 66 for those who lived. The overall mortality at 28 days was 36%, and 59% of deaths occurred outside hospital.

PRESENTATION

In 92% of heart attacks the general practitioner was called, even for sudden deaths, and in 80% of such calls the doctor was equipped with the practice defibrillator (fig 1). In 8% of cases the general practitioner was bypassed either because the victim had the heart attack away from home or

went directly to the hospital accident and emergency department or was taken there after an emergency call. The general practitioner was bypassed by 11% of men but by only 5% of women. Some patients with heart attacks presented to a doctor who was not on emergency duty, who therefore did not have the defibrillator. On one occasion on her way home a doctor visited a patient with "indigestion" after handing over the defibrillator to the next duty doctor. The patient had a cardiac arrest and died.

FIG 1—Flow chart showing outcome of 1011 heart attacks.

FIG 2—Cumulative percentage of all heart attacks by delay by doctor and by total (doctor+patient) delay.

In 15% of heart attacks the patient was dead by the time the general practitioner had arrived, but this figure includes many cases (7%) where the doctor did not attend urgently because the death was not unexpected or the patient was aged and any attempt at resuscitation would have been inappropriate; 3.5% died in the presence of the general practitioner. The total prehospital mortality was 19%. Nearly 8% of patients were accompanied into hospital, the doctor with the defibrillator usually following the ambulance by car. Three (0.3%) unaccompanied patients died in the ambulance on their way to hospital.

TOTAL DELAY

Thirty five per cent of patients came under general practitioner care within an hour of the onset of symptoms, and the median combined doctor and patient delay was 120 minutes (fig 2). The largest component of total delay was patient delay; total delay was comparable to that reported for a mobile coronary care unit summoned by general practitioners¹¹ but greater than that reported by British immediate care doctors.¹²

RESUSCITATION

Fifty six patients had a cardiac arrest in the general practitioner's presence or so recently before his or her arrival that resuscitation was considered. Cardiopulmonary resuscitation was attempted in 47 cases, representing 5% of calls to general practitioners, and the defibrillator used in 35 cases. Twenty one (45%) resuscitated patients survived to reach hospital, and 13 (28%) ultimately left hospital and were alive at 28 days. These early and late survival figures from cardiac arrest are comparable to the pooled results of five mobile coronary care schemes where out of hospital resuscitation was attempted in 967 patients, of whom 35% survived to reach hospital and 17% were ultimately discharged.¹³ Mobile coronary care units may attempt resuscitation in a higher proportion of heart attack victims, but it could be argued that resuscitation by a general practitioner with knowledge of the patient's background is less likely to be inappropriate.

Discussion

A group practice equipped with a single defibrillator and organised so that one doctor deals with emergency calls can get a doctor with a defibrillator to 80% of heart attack calls coming to the practice. Such organisation enables commendably short response times to be achieved, so that the doctors in our study were reaching patients soon enough after they had arrested for them to consider resuscitation attempts worth while. Other patients had cardiac arrest in their presence and cardiopulmonary resuscitation, with use of the defibrillator where appropriate, was undertaken in 5% of all heart attack calls. Although the general practitioners' individual experience of resuscitation was limited and they were working single handed, the success rate of out of hospital resuscitation matched that reported by mobile coronary care units.

The opportunities in general practice for attempting resuscitation occur sufficiently often and the results are sufficiently encouraging to justify every group practice possessing a defibrillator and to warrant training every general practitioner in advanced life support.

From our results we estimate that a practice with 10 000 patients might expect to deal each year with about 35 heart attacks with one or two attempts at resuscitation. Perhaps one patient might be expected to leave hospital after successful resuscitation every second year. One doctor in such a practice may carry out cardiac resuscitation once every second year, with a successful outcome once in a decade or three or four times in a professional lifetime.

These are the measurable results of having and using a defibrillator, but there are associated benefits that are less easily quantified. Providing early coronary care and organising a practice along the lines described results in patients coming under care earlier and entering hospital or a coronary care unit when the risk of primary ventricular fibrillation is still high. The chances of correcting

ventricular fibrillation are better in a coronary care unit than outside the hospital, so early admission to hospital undoubtedly saves lives, though this is difficult to prove.

The general practitioner's concern in early coronary care leads to a greater appreciation of the intractable problem of sudden death in the community and underlines the importance of preventive cardiology. We do not think that intervention and prevention need to compete for resources, they are complementary approaches to a major problem.

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100 YEARS AGO

It used to be the fashion to laugh at the American for laying out plans for a city on a site where as yet only a few log cabins existed; but they laugh loudest who laugh last. George Washington, when he founded the city which bears his name, drew out, with the assistance of Andrew Ellicot, the surveyor, plans for a metropolis on so grand a scale, that even yet not a quarter of the site is covered. The result has been indeed a "city of magnificent distances," but a city with noble streets and avenues conveniently arranged for traffic, and with many open spaces scattered throughout its length and breadth. We do not, it is true, often have an opportunity of laying out a brand new city, though we are constantly building huge suburbs to existing cities, which in point of extent are equal to new towns; but our way of going about the business is quite different. The builder, who thinks he sees his way to a successful speculation, buys a field and builds as many houses on it as he can squeeze in. Another builder buys some neighbouring field, and pursues his way quite oblivious of the arrangements of his rival. The result is such terribly ugly and inconvenient tracts of houses as the suburb so graphically described by Professor Hayter Lewis in his address to the Architectural Section of the Sanitary Congress at Bolton. "The builders," he said, "have acquired one field after another and followed its irregular forms, or those of

the country cross roads or ditches, in laying out their new streets, and the result is about as bad a plan as it is possible to imagine—not in the slightest degree picturesque, simply puzzling and exasperating." As he was able to show, a little foresight, a little supervision on the part of the local authorities, if they had any authority in the matter, would have secured the creation of a suburb at once more convenient, less ugly, and more healthy upon the same space of ground, and without loss to the speculating builders. But the evil does not end with the generation which created it; it goes on increasing until the inconveniences and dangers become intolerable, and then the ratepayers have to buy up the land at an enormously enhanced price, in order to drive roads through it which shall be thoroughfares, and not crooked alleys leading at one end to the blank wall of a railway, and at the other into a slum. Professor Lewis believes that the grievance can only be removed by legislation, giving corporations and local boards special powers, such as they already possess and sometimes exercise, with regard to the construction of houses, and the width of streets. The present absence of system, which is neither profitable to the builders nor convenient to the inhabitants, and unfavourably affects the public health, ought to be brought to an end. (*British Medical Journal* 1887;ii:732.)