PRACTICE OBSERVED

Practice Research

Defibrillators in general practice

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Abstract

After a successful pilot scheme introduced in 1975, when six portable defibrillators were provided for health centres, an additional 50 defibrillators were provided in February 1982 for general practitioners to use. Between December 1975 and February 1984 defibrillation was attempted in 54 patients who collapsed with clinical cardiac arrest in the presence of a general practitioner or less than five minutes before their arrival. A cardiac output was achieved in 32 patients, 28 survived to reach hospital via a mobile coronary care unit, and 22 were discharged alive. Of the 28 admitted to hospital, 24 were found to have myocardial infarction. If all general practitioners carried defibrillators they might make an important dent in the early mortality from myocardial infarction in addition to that achieved by a mobile coronary care unit.

Introduction

Most deaths due to acute myocardial infarction occur within the first few hours after the onset of symptoms. These early deaths are almost always due to ventricular fibrillation.^{1,2} Among patients monitored within one hour of the onset of symptoms about 9% developed ventricular fibrillation within the first hour and 13% within four hours.^{3,4} The greatest potential for prevention of these early deaths lies in prompt medical attention, including the availability of defibrillation. Rawlins

has shown that of 111 deaths due to acute myocardial infarction, 23 occurred in the presence of the general practitioner and he suggested that all general practitioners should be equipped with defibrillators.⁵

Since 1975 small, portable, easily operated defibrillators have been commercially available at reasonable cost (roughly £1000). General practitioners in our area agreed to carry these defibrillators and to attempt defibrillation of patients who had clinical cardiac arrest in their presence or shortly before their arrival.

Methods

In December 1975 six small portable defibrillators (Cardiac Records 280 series Pantridge defibrillator), purchased from Mid-Ulster Hospital voluntary funds, were distributed to local health centres, where they were kept on charge and available for use. General practitioners who wished to carry them on calls where a coronary attack was suspected. The practitioners were given simple operating instructions, including a reminder of the criteria for recognising clinical cardiac arrest: sudden collapse, often preceded by chest pain, with absent pulse and heart sounds, with interruption of regular respiration, which becomes intermittent and gasping. (Complete absence of respiration and dilated pupils indicate prolonged cardiac arrest and the diagnosis should be made before this occurs.)

As soon as possible a direct current shock of 200 joules is delivered, with the left hand paddle of the defibrillator placed below the right clavicle and the right hand paddle as near the left mid-axillary line as possible at the level of the cardiac apex. Both paddles are, if possible, smeared liberally with suitable conductive gel. If a cardiac output (pulse and heart beat) is not established 15 seconds after the initial shock then subsequent shocks of 400 joules are delivered, waiting 15-30 seconds between shocks to check for the presence of a cardiac output. Standard cardiopulmonary resuscitation techniques are applied when appropriate. In the event of the recovery of a detectable cardiac output the practitioner usually administers lignocaine 100 mg intravenously. The nearest mobile coronary care unit is summoned as soon as possible and, after cardiac rhythm and the haemodynamic state are stabilised the patient is transferred to hospital.

During the first few years several patients were successfully resuscitated and we were encouraged to expand the scheme. In

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February 1982 50 similar defibrillators (Ligarex mini-defibrillator, Temsch) were purchased with the help of a bequest to the Waverley Hospital Cardiac Unit. These were distributed to general practitioners who were willing to carry them in the Antrim and Ballymena districts, which is adjacent to the Mid-Ulster district. Several practitioners also had electrocardiograms and a few had cardiac mini-monitors. Most practitioners had no formal cardiac training, but after about 15 minutes of personal instruction in the use of the defibrillator all were reasonably confident in their ability to use them.

The population served by the practitioners in the past two years of the scheme was roughly 100 000, with the urban-rural distribution at about 40% to 60%.

Results

Between December 1975 and 29 February 1984 defibrillation attempts by general practitioners were documented in 54 patients who collapsed with clinical cardiac arrest less than five minutes before the practitioner's arrival or in his presence (table)—that is, when there was a realistic possibility of resuscitation. The patients were aged 36 to 84 (mean 64) and 39 were men. Clinically detectable cardiac output

Survival of patients with clinical cardiac arrest who were defibrillated by general practitioners

	Collapse before doctor's arrival	Collapse in doctor's presence	Total No
Patients defibrillated	22	32	54
Cardiac output established	11	21	32
Admitted to hospital	11	19	30
Admitted to hospital	11	19	30
Discharged alive	8	14	22 (41%)

could not be established in 22 patients. Two had further cardiac arrests and died before the mobile coronary care unit arrived, and two died after recurrent ventricular fibrillation in the mobile unit. 28 survived to reach hospital and 22 were discharged alive. Of 37 patients under 70 years of age, 19 survived to leave hospital compared with three of the 17 patients over 70.

Cardiac symptoms preceded collapse in 47 patients, of 25 who survived to reach hospital, 24 were subsequently diagnosed as myocardial infarction and one as myocardial ischaemia without infarction. Of the three survivors from unheralded cardiac arrest, one had dilated cardiomyopathy, one was severely hypotensive, and in one no cause was found.

When the mobile unit arrived all resuscitated patients were in sinus rhythm, except four. Two had complete heart block, one had atrial fibrillation, and one had just collapsed again with recurrent ventricular fibrillation, which was again corrected by defibrillation. All resuscitated patients had a systolic blood pressure >90 mm Hg before transfer to hospital. After admission four patients had at least one further episode of ventricular fibrillation.

After discharge from hospital eight patients died from one month to three years later, and 14 are still alive one month to seven years later. The actuarial survival over three years is shown in the figure.¹ None of the survivors showed permanent evidence of appreciable cerebral dysfunction.

During the past two years of the study when defibrillators were widely available defibrillation was attempted in 30 patients and 11 survived to leave hospital. This represents roughly one life saved every two months among a population of 100 000.

Discussion

Recently, general practitioners, especially those with coronary care experience, have shown interest in the use of defibrillators.⁶ Many have reservations about their safety, in particular when used blindly without electrocardiographic monitoring. If a cardiac arrest is not due to ventricular fibrillation or if the resuscitation and defibrillation will be ineffective but harmless. Other causes of collapse such as epilepsy, stroke, vasovagal attack, or hypoglycaemia are unlikely to be misdiagnosed as

Actuarial survival over three years for patients discharged from hospital.

cardiac arrest by any competent practitioner. Despite initial reservations, we have shown that general practitioners used defibrillators appropriately and often successfully in clinical practice. During the study there were no cases of inappropriate defibrillation to our knowledge. We think that in a clinical cardiac arrest, in circumstances suggesting a cause of cardiac infarction, attempted defibrillation should not be delayed because of the absence of electrocardiographic evidence of ventricular fibrillation. Furthermore, lives were saved by the general practitioners performing defibrillation in addition to those saved by the mobile coronary care unit.

The survival rates of 52% to reach hospital and 41% to discharge compare favourably with previously reported results from out of hospital resuscitation by mobile coronary care units in Europe^{7,8} and America.⁹ As reported, younger patients were more likely to survive to discharge.^{10,11} Surprisingly, the success rate among patients who collapsed before the practitioners' arrival was not much worse than for those who collapsed in their presence, but some mobile units have achieved similar success.^{12,13,14} Our results were probably favourably influenced by attempting resuscitation only when the collapse had occurred shortly before the doctor's arrival, since successful resuscitation is closely related to starting resuscitative measures promptly.¹⁵ Furthermore, the availability of medical skill from the general practitioners with prompt support from a medically planned mobile unit allowed more stable stabilisation of the patient's haemodynamic state after defibrillation than might be expected from paramedics before transfer to hospital.

None of the three survivors of unheralded cardiac arrest in our series had myocardial infarction, while all of those with preceding cardiac symptoms had acute myocardial infarction or, in one patient, myocardial ischaemia without infarction. These findings are consistent with the view that the factors causing instantaneous death may be different from those causing ventricular fibrillation complicating myocardial infarction.¹⁶

The diligence of the general practitioners in carrying the defibrillators was probably variable because several cardiac arrests occurred in the presence of practitioners who did not have their defibrillators. Only two of the reported episodes occurred in health centres. It is therefore essential that defibrillators are carried on house calls and not left unused in doctors' surgeries. In highly motivated practices where a defibrillator was carried routinely on house calls the general practitioners used defibrillation for clinical cardiac arrest in roughly 10% of all patients attended for myocardial infarction, and half of these episodes occurred in their presence.

The effectiveness of defibrillation in general practice is augmented by the availability of mobile coronary care. If a mobile coronary care unit is not available, as is regrettable in the case throughout most of the United Kingdom, then antiarrhythmic cover with intramuscular lignocaine and an appropriate intravenous dose of sodium bicarbonate should be

given in addition to any other clinically indicated treatment before transfer. The practitioner, with his defibrillator, may choose to accompany his patient to hospital.

Community training schemes in cardiopulmonary resuscitation have produced encouraging results in North America and Oslo, but a recent report from Brighton was disappointing.^{17,18,19} During five years, when 20 000 people were trained in cardiopulmonary resuscitation the trainees mostly contributed to the survival of only five patients with cardiac arrest complicating heart disease. Providing general practitioners with defibrillators seems more cost effective in time, effort, and expense and is a logical evolution of prehospital coronary care.

The bequest of the late Miss Margaret Maybin, Aghnashen, Broughshane, to the Waverley Hospital cardiac unit made possible the purchase of defibrillators used in this study. We thank all those general practitioners who accepted defibrillators for their cooperation and enthusiasm.

References

1. Lowy B, Fabbro AM, Hoad WB, Jay TM, Thoms GW. The coronary care unit: new perspectives and directions. *JAMA* 1981;190:188-96.
2. Adgey AAJ, Nelson PG, Scott ME. Management of ventricular fibrillation. *British Medical Journal* 1980;1:1189.

3. Baum RS, Alvarez HA, Cobb LA. Survival after resuscitation from out-of-hospital cardiac arrest. *Circulation* 1974;49:1231-5.
4. Adgey AAJ, Nelson PG, Scott ME, et al. A study of the effect of myocardial infarction on the survival of patients with ventricular fibrillation. *Br Med J* 1981;190:188-96.
5. O'Doherty M, Taylor DJ, Quinn E, Vincent R, Chamberlain DA. Five hundred patients with ventricular fibrillation: a study of survival rates. *Br Med J* 1981;190:188-96.
6. Reelley J. Study of the management of suspected myocardial infarction by British immediate care doctors. *Br Med J* 1981;190:188-96.
7. Brennan J, Clegg R, Coleman J, et al. *Proc Staff Meet* 1981;190:188-96.
8. Gaulty CJ, Kelly M, Gaulty GJ, Mulcahy R. Pre-hospital coronary care. *Br Med J* 1980;190:188-96.
9. Mackintosh AF, Craib AB, Grainger R, Williams JH, Chamberlain DA. The Brighton study: a study of survival rates in patients with out-of-hospital cardiac arrest. *Br Med J* 1978;1:1115-16.
10. Lofgren B, Shollberg A. Cardiopulmonary resuscitation by lay people. *Lancet* 1976;1:702-4.
11. Silfverstam P, Sandberg S, Nyström L. Impact of a mobile coronary care unit on the sudden coronary mortality in a community. *Acta Med Scand* 1977;198:159-70.
12. Vetter R, Proulx S, Haines MC. Defibrillation: the use of a mobile coronary care unit upon the community. *Br Med J* 1979;1:181-2.
13. Emswiler J, et al. Defibrillation: the use of a mobile coronary care unit in the community. *Br Med J* 1979;1:181-2.
14. Lofgren B, Naei EL, Hirschhorn CO, Nussendorf SR. Pre-hospital ventricular fibrillation: prognosis and follow-up course. *N Engl J Med* 1974;291:117-21.
15. Emswiler J, Berger L, Hallstrom A. Paramedic programs and out-of-hospital cardiac arrest: a review of the literature. *Am J Med* 1979;66:1-10.
16. Thompson RG, Hallstrom AP, Cobb LA. Bystander-initiated cardiopulmonary resuscitation in management of ventricular fibrillation. *Am J Med* 1979;66:1-10.
17. Vincent R, Martin R, Williams G, Quinn E, Robertson G, Chamberlain DA. A community training scheme in cardiopulmonary resuscitation. *Br Med J* 1980;190:188-96.

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Papers That Have Changed My Practice

Researching drug treatment

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Since entering into partnership in this semirural practice on the edge of the Peak District National Park in 1970 I have had a deep interest in research in general practice, particularly in the problems of drug treatment and adverse effects of drugs in the community. After a year in practice I felt that there must be more to the job than simply dealing with the seemingly endless flow of patients who expected me to keep them supplied with antibiotics for uncomplicated upper respiratory illness and with psychotropic drugs whenever they experienced a minor ripple in their emotional and family lives.

I became more and more concerned over my inadequate monitoring of patients having long repeat medication and developed strong reservations about the claims of some pharmaceutical company representatives for the alleged freedom from side effects of many of their products. I became interested in pharmacology and therapeutics, as an undergraduate, and I knew that most work done on adverse effects of drugs was related to studies of inpatients. Accordingly, I resolved to try to obtain some information on the problem of adverse effects of drugs as they affected patients in my own practice.

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MD thesis from general practice

While looking through a copy of *Update* in 1971 I came across an article by Williams that indicated that it was possible to submit an MD thesis from general practice.¹ Five years previously Wilson had written of the paucity of successful MD degrees from general practice, and Williams subsequently showed that in the 15 years before 1973 only 3.4% of a total of 2201 MDs were from general practice.² Having discovered that it was not necessary to hold a formal academic post to write an MD, and not being particularly deterred by knowing that few successful MD theses had been submitted from general practice, I set about writing one on the problem of monitoring for adverse effects of drugs in general practice.

The decision to write an MD thesis appreciably influenced, and will continue to influence, the way in which I see my role as a general practitioner. I had to submit a research protocol to three supervisors, and the experience gained in designing this has been invaluable when planning subsequent research projects. I learnt about the problems associated with the design of questionnaires and the difficulties associated with carrying out research 'in the field'.³ I learnt of the importance of interpreting results with caution and of the evaluation of bias and an important section of my MD, which has been published as a separate paper, examined the difficulties of using a questionnaire for monitoring adverse effects of drugs in the community, in particular whether paramedical staff might successfully be employed to obtain information on drug side effects in this way.⁴

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I did much background reading on monitoring for adverse effects of drugs, and several papers to which I still refer had a major influence on the work for my MD. I thought at the time that the paucity of MD degrees from general practice was a sad reflection of the academic status of the subject, and I have recently argued for encouraging more MDs from general practice, perhaps through a network of 'MD tutors' or as an additional course for trainees who wish to pursue serious research after completing vocational training.⁵

Monitoring for adverse effects of drugs in general practice

In 1973 Mulroy had recorded all consultations where he thought that there was an iatrogenic precipitating factor,⁶ but in the preparatory work for my MD I had arrived at the conclusion that I would be most likely to obtain a more complete measure of the incidence of adverse effects of drugs in the community by applying intensive monitoring techniques, where the patient is actively sought and questioned about the onset of symptoms that may be drug induced. Such techniques were successfully used in surveys of inpatient populations, such as those of Hurwitz and Wade and the Boston Collaborative Drug Surveillance Program.^{7,8} These papers influenced considerably the design of my proposed survey of adverse effects of drugs in the community, and the questionnaire used in Hurwitz and Wade's investigation was adaptable for use in general practice. The classification of symptoms and signs in the BCDS programme into 'certainly', 'probably', 'possibly', or 'unlikely' to be drug related is undoubtedly subjective, but I still find it useful to apply on occasions when attempting to evaluate events that are potentially drug induced in a patient. I believe that it is a direct result of reading these papers that I consider any symptoms presented by a patient during a course of treatment to be potentially iatrogenic.

I reported that 41% of patients who were prescribed drugs in my survey either certainly or probably suffered from an adverse effect of the drug as a result.⁹ This figure, much higher than that reported by Mulroy, is probably a consequence of the use of intensive surveillance of the patients monitored in my survey.⁶ A subsequent investigation of elderly patients on long term medication indicated that 36% were suffering from symptoms or 'events' that were considered to be drug related.¹⁰

Event recording during drug administration

Recent developments in drug monitoring using epidemiological methods have emphasised 'event recording' in clinical trials. Skeggs and Doll drew attention to the earlier work of Finney on the case for recording events in clinical trials.^{11,12} These authors argue that all adverse events should be recorded during clinical trials, irrespective of any supposed link with the

drug under investigation, to be distinguished from adverse reactions, where a value judgment has to be made concerning the probability of the recorded reaction being drug induced. Events would come under suspicion of being drug related if they were shown to occur more commonly in treated groups than in controls.

The procedures for drug monitoring in my practice have been influenced by the emergence of event recording as the probable method by which information on adverse effects of drugs will be obtained in the future. To complement my earlier work on adverse effects of drugs in general practice I have inaugurated a long term survey of events occurring in patients on single or multiple drug treatment with a 'control' record of events occurring in groups of patients taking no drug treatment. It is envisaged that over a period of years patterns of events may be distinguished as they evolve in treated and in untreated groups of patients, and it should be possible to identify particular events that are linked to specific drug treatment. An event record sheet has therefore been designed on which any events reported by the patient at the time of interview may be easily and quickly recorded, either before starting drug treatment or at specified intervals at a later date.

Over 80% of drugs are prescribed in the community, and I think that it is the responsibility of the general practitioner to carefully monitor patients for potentially harmful effects of drugs. The papers that I have referred to have had a major influence on the design and execution of research projects in my own practice, and I believe that they have thus contributed to improved care for the patients concerned through my increased awareness of both the dangers that may be associated with drug treatment and of the methods that may best be used in the future to obtain good information on the nature and incidence of unwanted effects of drugs in general practice.

References

1. Williams WO. Writing an MD thesis. *Update* 1971;14:369-71.
2. Wilson GM. Degree of MD by thesis. *Br Med J* 1966;1:58-61.
3. Williams WO. MD by thesis from general practice. *J R Coll Gen Pract* 1974;24:176-8.
4. Martys CR. Monitoring adverse reactions to antibiotics in general practice. *J Epidemiol Community Health* 1982;36:246-7.
5. Martys CR. Encouraging more MDs from general practice. *Update* 1983;28:28.
6. Mulroy R. Adverse drug reactions in general practice: its incidence and effects. *Br Med J* 1973;1:401-3.
7. Hurwitz B, Wade J. The use of intensive monitoring of adverse reactions to drugs. *Br Med J* 1969;1:931-6.
8. Hurwitz B, Wade J. The use of intensive monitoring of adverse reactions to drugs. *Br Med J* 1969;1:931-6.
9. Martys CR. Adverse reactions to drugs. *Br Med J* 1980;1:931-6.
10. Martys CR. Adverse reactions to drugs. *Br Med J* 1980;1:931-6.
11. Skeggs D, Doll R. The case for recording events in clinical trials. *Br Med J* 1977;1:153-4.
12. Finney DJ. The design and logic of a monitor of drug use. *J Chron Dis* 1965;18:77-98.

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It is to be noted that from a sanitary point of view the itinerant showman is not a desirable neighbour. But little control can be exercised over his habitation or caravan, which is much more of a castle than the typical Englishman's dwelling, and which cannot, under ordinary circumstances, be brought within the provisions of the Sanitary Acts. On the occurrence of infectious disease in one of these vehicles, the efforts of the local authority to secure isolation or disinfection are next door to hopeless. A few weeks since (see *British Medical Journal*, 1984;1:1884, p. 438) our columns contained an account of the extensive diffusion of scarlet fever through the agency of a travelling van. This is by no means an uncommon occurrence; and it seems a pity that Dr William Harcourt, M.P., should have been so careless in his aspect of the case against the peripatetic class of roadside entertainers. (*British Medical Journal* 1884;1:573.)