

Reality of out of hospital cardiac arrest

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Heart 2005;91:1505–1506. doi: 10.1136/hrt.2005.061572

The high mortality rates associated with out of hospital cardiac arrest, particularly those occurring in the home, stress the need for early treatment in the form of publicly accessible external defibrillators

Frank Pantridge, who died in Belfast late last year, established the need for effective pre-hospital coronary care.¹ He confirmed that most sudden unexpected deaths in the community are caused by ventricular fibrillation (VF) in the presence of coronary disease or ventricular scarring, and that such deaths could be prevented by early defibrillation. He then took up the concept of public access defibrillation with characteristic zeal and urged that defibrillators should be as readily available as fire extinguishers. He asked, "Is property more important than life?"

Three months after Pantridge's death, in a special nationally televised "Larry King Live" show, sponsored by the American College of Cardiology, the noted comedienne Phyllis Diller was assured by Dr PK Shah of Los Angeles that he would be able to teach her to use an automatic defibrillator in 15 minutes.

PUBLIC HEALTH CHALLENGE

Sudden unexpected death from ventricular fibrillation (VF) is a perplexing public health challenge. The numbers are huge—almost half a million each year in the USA.² Defibrillation is effective in over 90% of cases if applied within one minute, but ineffective in over 90% if applied 10 minutes later, even if cardiopulmonary resuscitation (CPR) is performed.³ Persons at high risk, such as US Vice President Dick Cheney, can be identified, and have a defibrillator implanted at a cost of over US\$20 000 for the device alone. But such high risk individuals make up the minority (perhaps 5%) of those who develop VF; the vast majority of those who develop VF were previously well, and a minority only had suffered any cardiac event.^{2,3}

The principles set out by Pantridge have now been endorsed by the European Society of Cardiology and European Resuscitation Council.⁴ The first recommendation is to have defibrillators available on all ambulance vehicles; subsequent recommendations relate to more widespread community application. Sites of frequent cardiac arrest are those where older adults are exposed to unaccustomed exertion or emotion, such as airports, rail terminals, sporting events, and gambling casinos.³ Good results for management of VF at these sites have been reported, the most impressive being 55% one

year survival in Chicago's airports.⁶ Good results have also been reported for aircraft, where the population is under scrutiny, but with no chance of outside help within 10 minutes.⁷ But the total experience from around the world is similar—that most episodes of cardiac arrest (and presumably VF) occur in the home and cannot be attended by ambulance based or other community based services within 10 minutes.³

In this issue of *Heart*, Norris *et al* report their study on the circumstances of out of hospital cardiac arrest.⁸ Over a period of two years there were 1325 cases of cardiac arrest in a population of 954 000 in the health districts of Brighton, South Glamorgan, and York. The study was thorough and comprehensive, with events determined from death certificates and coroner's necropsy (in 86%), hospital and general practitioner records, and interviews of relatives and emergency workers. Sudden death from non-cardiac disease was excluded. Groups deemed unlikely to benefit from defibrillation (those 76 years of age or older, those in chronic cardiac failure, those with other terminal illnesses, and those in nursing homes) were excluded.

MOST CARDIAC ARRESTS OCCUR IN THE HOME

The results of this study confirm those presented before. Eighty per cent of cardiac arrests occurred in the home and 20% in a public place. Nearly 90% of arrests in a public place were witnessed compared with less than 50% of those at home. Resuscitation attempts were twice as likely (41% *v* 22%) when arrest occurred in the public place rather than at home, and survival was better (8% *v* 2%). The best results were in persons who arrested while under medical or ambulance care, with some 35% of these surviving for 30 days; this group, however, comprised just 4% of the total with cardiac arrest. Investigators sought information on symptoms preceding the arrest. Where such was available, some 70% had reported preliminary symptoms of chest pain, breathlessness, or "other", and most such symptoms had been present for over 15 minutes.

Norris *et al*⁸ discussed their study in the light of previous work. They noted that the current Department of Health (DOH) programme of defibrillators in public places is unlikely to have had any impact, if it had been implemented at the time of this study (1994/5). They explored applicability of other measures as used elsewhere by police and fire departments, but noted the unlikely benefit to the majority who suffer cardiac arrest in the home. They did concentrate

Abbreviations: CPR, cardiopulmonary resuscitation; DOH, UK Department of Health; VF, ventricular fibrillation

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Published Online First
27 May 2005

on the frequency of premonitory symptoms, and good results of resuscitation when arrest occurred in a medical or paramedical setting, and argued for having persons better informed about summoning of ambulance or visiting a doctor should such symptoms occur.

The study by Norris *et al*⁸ is important in addressing the problem of out of hospital- cardiac arrest, but has to be put in perspective with other studies and experiences.

SYMPTOMS

There is no doubt that persons with new onset or unstable chest pain or discomfort should seek medical assistance or call an ambulance promptly. The majority of patients described such symptoms, but a lesser number described breathlessness or “feeling unwell”. Such symptoms are very common without cardiac arrest as a sequel and may not warrant urgent attention. Premonitory symptoms of arrest are similar to those of myocardial infarction and are widely reported in the literature.⁹ Recognition of such symptoms initiated Pantridge’s coronary ambulance service, and the public education campaigns promoted by groups such as Australia’s National Heart Foundation since the 1970s.¹⁰ Despite such efforts, denial appears to be the most common reaction to new symptoms, and is likely to remain. Education is not the (only) solution.

What remains? The most recent report of the DOH programme of lay responders gives known survival to hospital discharge of 25%,¹¹ with initial termination of VF in 132 of 140 persons, no major problems, and response time better than healthcare professionals. This must be regarded as a major advance, and worthy of implementation elsewhere. It cannot, however, address the problem of cardiac arrest in the home. So what can be done here?

Home defibrillation has been studied in survivors of extensive myocardial infarction whose subsequent risk of VF is very high. The earliest studies, conducted over 25 years ago in Seattle, were disappointing.¹² At the time, defibrillation was considered a part of CPR and spouses or partners/relatives were instructed in the whole complex process. Retention skills were not good and, more often than not, witnesses were reluctant to initiate any response when arrest occurred.¹² This issue has been tackled again in the ongoing HAT (home AED trial) trial. As before, patients are recruited on the basis of recent extensive myocardial infarction but are randomised to a group where a defibrillator is provided to the home, and a group without. Recruitment has been slower than expected. This study may suffer from the same problem as before—that is, reluctance of (often elderly) relatives to use a defibrillator in a person (often elderly) who is disabled from the other effects of extensive infarction.

TRAINING IN DEFIBRILLATOR USE

But should such experiences damn or delay home defibrillation? I think not. The problem remains of sudden unexpected death of persons with no or minimal known cardiac disease.

We now know that CPR as taught for decades is not crucial in the early period after cardiac arrest,³ that chest compressions alone can be as effective as “proper” CPR,¹³ so that extensive training is not necessary for use of a defibrillator while awaiting ambulance arrival. If an 80 year old Phyllis Diller can be taught in 15 minutes to use such a device then so can we all. Application of defibrillators on a widespread basis has been held back by “persons of process” who wish to impose “proper” training (and retraining),¹⁴ and by potential users who are not prepared to undergo such an exercise. Cost is no longer the issue, and will fall further if home defibrillation becomes more popular. The cost of an external defibrillator is now less than 10% of an implantable device (under US\$2000) and similar in price to a superior wide screen TV or home entertainment set up. Were Frank Pantridge still alive he might ask not “is property more important than life?”, but “is luxury more important than life?”.

The contribution of Norris *et al*⁸ is but one in a remarkable career that has helped transform coronary care—and has directed this as did Pantridge into the community. He and the original father of coronary care, Desmond Julian, have provided the data, and the practical approach to a disease whose major problem cannot be evaluated by conventional “evidence based” methods.¹⁵

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