THE ARRHYTHMIA WORKFORCE

KEY POINTS:

1. There is inequity in arrhythmia service provision both nationally and within Europe
2. In order to reach European averages, 4-6 electrophysiologists per million population are required (in addition to local pacing services).
3. Every district general hospital should provide a pacing service.
4. This will require recruitment of more doctors technicians and nurses.
5. ICD implantation and follow up should be devolved to those in DGHs interested in providing a service.
6. This will require recruitment of more doctors technicians and nurses.
7. Specialist clinics have the potential to streamline much of the investigation and follow up required for arrhythmia patients and should be encouraged.
8. Electrophysiologists/pacing doctors should where possible relinquish general medicine (and general cardiology) commitments to allow them to spend more time with arrhythmia patients.

Dr Janet McComb, Freeman Hospital, Newcastle & Dr Adam Fitzpatrick, Manchester

INTRODUCTION

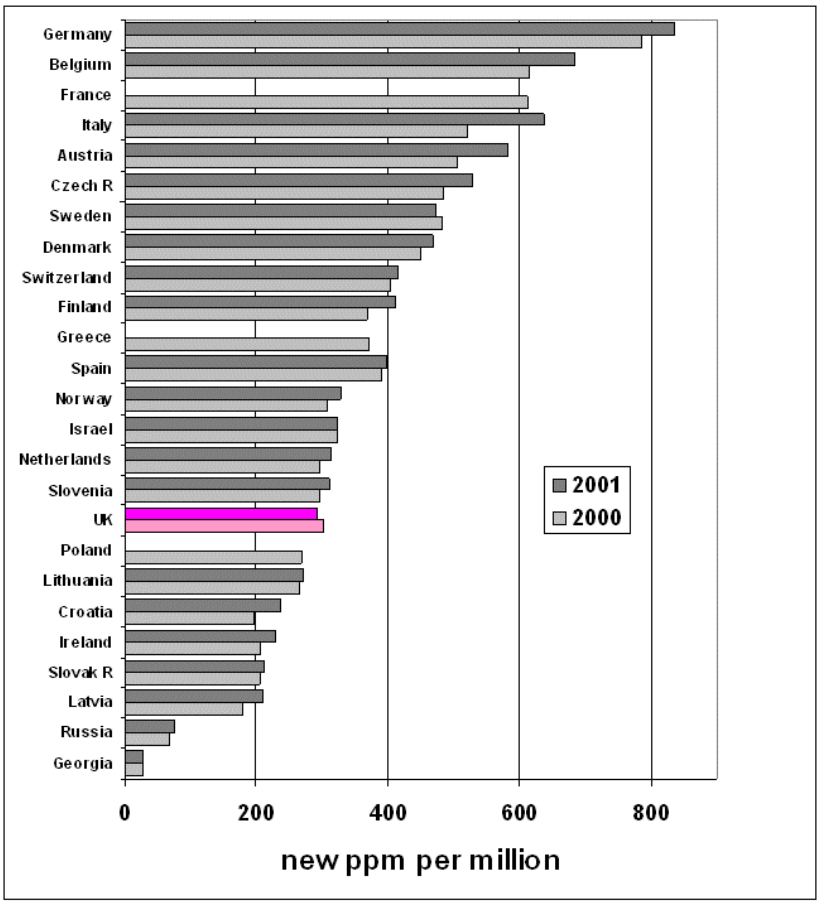
It is clear that there is very significant underprovision of arrhythmia services in the United Kingdom. This underprovision is evident in a variety of ways:

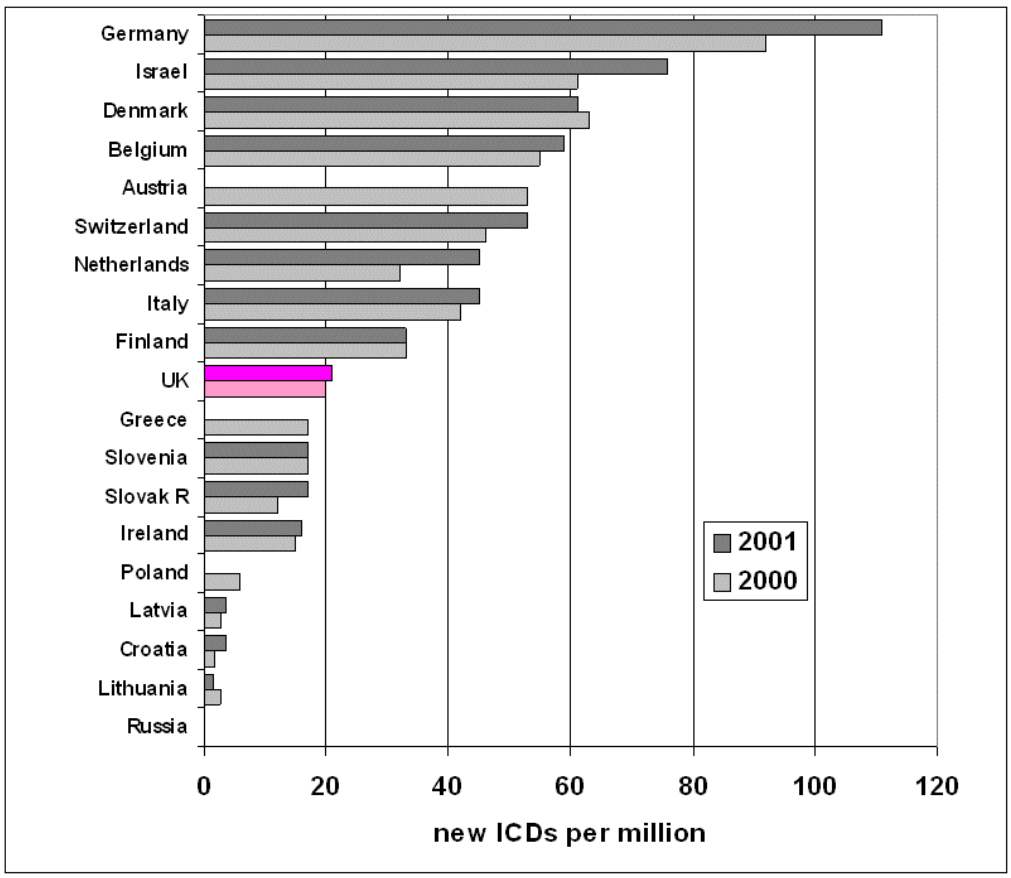
1. Very low PPM and ICD implantation rates compared with comparable countries in Western Europe.
2. Geographical inequities within the UK in access to specialist procedures in the United Kingdom, evidenced by marked regional variation in device implantation rates.
3. Long waiting lists in the UK for elective “electrical” procedures such as radiofrequency ablation.
4. Inappropriately long waiting lists for elective pacemaker and ICD implantation.
5. Delays in transfer of inpatients requiring device (PPM, ICD or cardiac resynchronisation therapy (CRT)) from district general hospitals to implanting centres.

COMPARISON WITH WESTERN EUROPE

It is clear from data collected by the European Working Group in Cardiac Pacing that the implantation rate of devices in Europe varies widely among countries with apparently similar populations and wealth. The reasons for this are not clear. It is also clear that implantation rates in the UK fall far below apparently comparable Western European countries such as Germany, Belgium and France.

Pacemaker (top) and ICD (bottom) implantation rates in 2000-2001 in Europe[1]



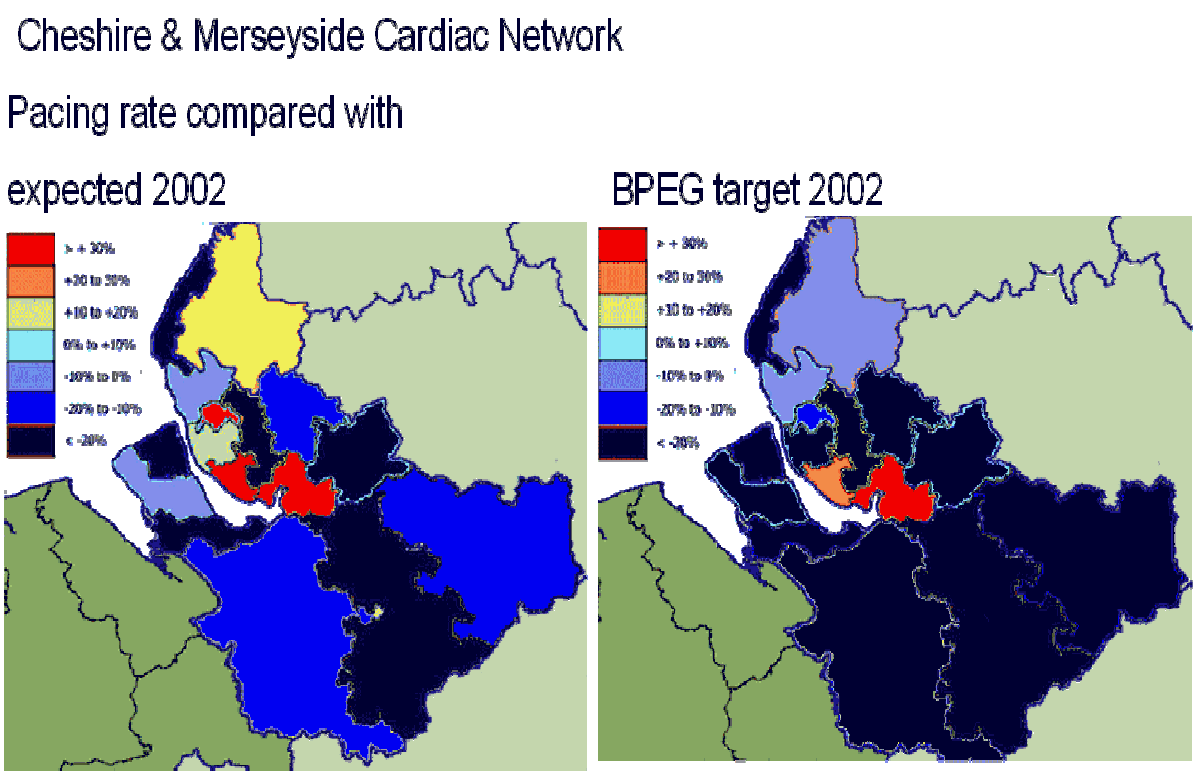


GEOGRAPHICAL VARIATION WITHIN THE UK

The National Pacing and ICD Database has been able to demonstrate marked regional variation in pacemaker and ICD implantation rates. Two examples are shown.

REGIONAL VARIATION IN PACING

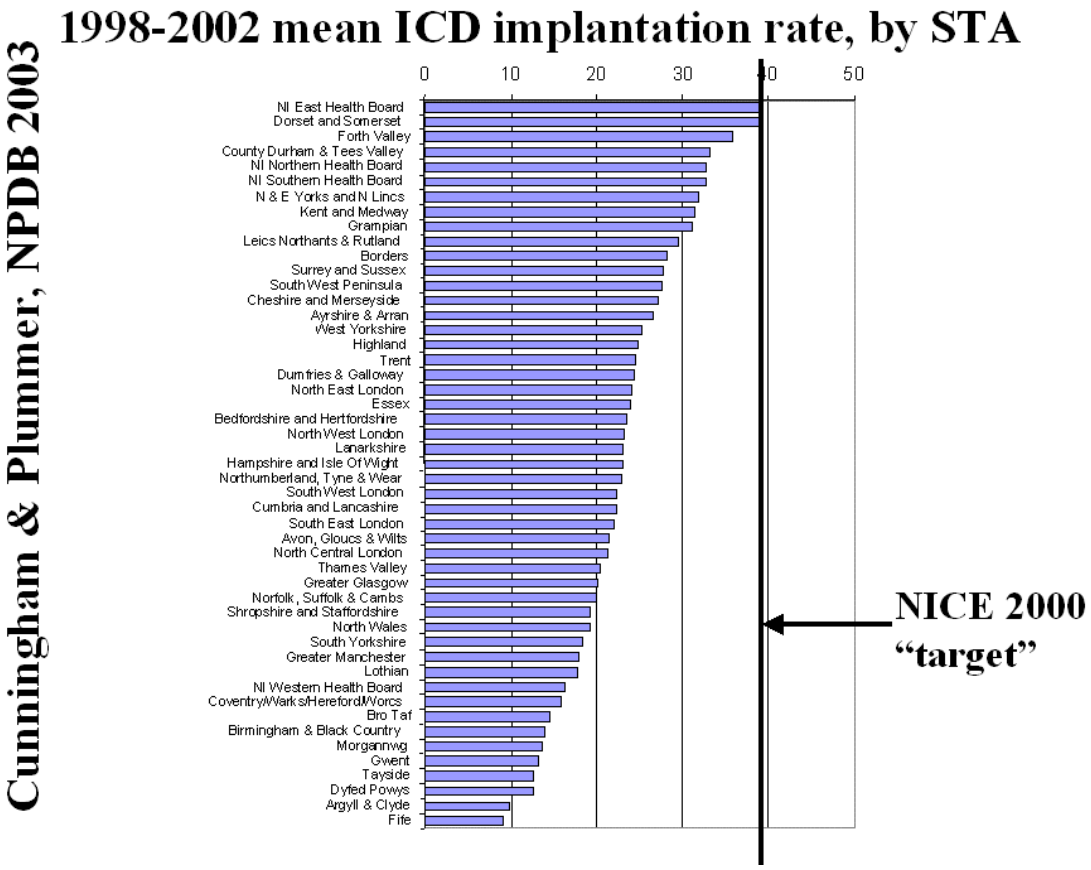
Detailed analysis by Charles and Cunningham[2] of both local data and data submitted to the National Pacemaker and ICD Database show important variation in pacemaker implantation rates within adjacent districts, with implantation rates varying from 114 to 787 per million (compared with a recommendation of 450 per million). One example is shown in the diagrams, which show implantation rates by PCT compared with the national average (left), and with the BPEG "target" of a national average of 450 per million.



It is clear, that even within adjacent PCTs, served by the same pacemaker implanting centre, implantation rates may vary enormously, for reasons that are uncertain, but likely have to do with local enthusiasm to provide the service. In many cases in the past this enthusiasm is manifestly not shared by local commissioners of care, and this will have to change.

REGIONAL VARIATION IN ICD IMPLANTATION RATES

Similarly, analysis of data submitted to the National Pacemaker and ICD Database[3], and corroborated by checking each individual ICD centre, has shown a 30 fold difference in ICD implantation rates among strategic health authorities. This is illustrated in the figure below.



REASONS FOR INEQUITY

The reasons for this geographical inequity, both nationally and internationally, are not straightforward. Analysis suggests that the factors such as an interested enthusiastic local cardiologist[4] may be extremely important. Other factors considered include number of arrhythmia centres, and distance from an arrhythmia centre.

CARDIOLOGISTS REQUIRED

There are relatively few cardiologists in the UK compared with Western Europe. In 1997,[5] there were 8 cardiologists per million, compared with 24/10^6 in Germany, and 83/10^6 in France (and 63/10^6 in the US[6]). In 2000,[7] there were 12/10^6 in the UK, 30/10^6 in Germany, and 65/10^6 in France.

In 2000, there were about 35 electrophysiologists in the UK, [8] ($0.6/10^6$ inhabitants, 1 per 7 cardiologists), compared with 3.79 electrophysiologists per million (or 1 per 16 cardiologists) in the US. [9]

Thus there appears to be a marked shortfall in the UK in both any cardiologists and electrophysiologists.

The British Cardiac Society has recommended in the Fifth report on the provision of services for patients with heart disease[10] that there should be 1 cardiologist per 50,000 inhabitants, or $20/10^6$ increasing by 2010 to 1500 cardiologists ($25/10^6$ or 5 in every district general hospital)
This would allow for the development of a pacing centre in every district general hospital, and might allow the devolution of ICD and CRT implantation from tertiary centres. The Fifth report has also recommended that there be 2 – 3 electrophysiologists in each tertiary centre, serving 1.5 million people. There should therefore be 80 – 120 electrophysiologists in tertiary centres in the UK. These calculations still fall far short of the numbers in Western Europe.

CARDIOLOGISTS REQUIRED TO PROVIDE ARRHYTHMIA SERVICES

Alternative ways of considering the numbers of doctors required include:

1. Examining the numbers practising in other countries in the same field.

2. Examining the number of procedures required and calculating the number of doctors required to do them*.

ELECTROPHYSIOLOGISTS IN OTHER COUNTRIES

The Heart Rhythm Society (formerly the North American Society of Pacing and Electrophysiology, NASPE) conducted a survey of arrhythmia management. The numbers of procedures and the numbers of doctors required to perform them in 1996 are shown in the table.

Procedure	Pacemakers	ICDs	Ablation	Source
Numbers	$604/10^6$	$80/10^6$	$150\text{-}350/10^6$	NASPE survey 1996
Full time doctors required	$2.0/10^6$	$0.4/10^6$	$2\text{-}3/10^6$	
Number			$125/10^6$	Spanish ablation registry 2002
Full time doctors required			$1.5/10^6$	

In Canada there was 1.25 (1 full time equivalent) electrophysiologists per million, working in 16 electrophysiology centres. In Spain, in 2002, 83 (60 full time, or 1.5 per million) doctors performed 125 ablations per million, in 42 centres.[11]

These figures suggest that 4-6 electrophysiologists per million population are required (to do 600 pacemakers, 80 ICDs and 125 ablations per million per year), which exceeds the Fifth report's estimate of 3-4 per million (tertiary centre + district

general hospital pacing doctors). These estimates **do not** take into account provision of cardiac resynchronisation therapy.

PROCEDURES REQUIRED & DOCTORS TO DO THEM

An alternative method of estimating the numbers of doctors required is to estimate the numbers of procedures required. Hackett[12] [13] has estimated the number of catheter laboratory sessions based on a variety of "electrical" targets. 304 catheter laboratory sessions are required to provide basic electrical requirements (450 per million new pacemakers, 100 per million replacement pacemakers, 50 per million new and replacement ICDs, and the 66 EP studies per million required by NICE to select post infarction patients who satisfy MADIT criteria for ICD implantation) for each million of population. This will require four consultants per million to cope with this workload alone. A further consultant will be required to undertake 125 SVT ablations per million per year.

	Pacemakers	ICDs	Electrophysiology		Total
"target"	450 + 100/10^6	50/10^6	66/10^6 VT stims	125/10^6 RFA	
Source	Fifth report	NICE HTA #11[14]	NICE	Spain 2002	
# lab sessions/10^6	257	25	22	84	369
# consultants/10^6					5

These calculations assume:

(i) catheter laboratory used for 40 weeks per year
(ii) 2 lab sessions per week per consultant
(iii) **NO TIME FOR TEACHING OR TRAINING**
(iv) **NO COMPLEX ABLATION**
(v) NO AF ABLATION
(vi) NO CARDIAC RESYNCHRONISATION THERAPY
(vii) NO PACEMAKER EXTRACTION

Requirements regarding staffing arrhythmia services have been described in a British Cardiac Society/British Pacing and Electrophysiology Group document. [15]

TECNICIANS/CLINICAL PHYSIOLOGISTS

The consultant of course does not work unaided, and is only one member of a team providing expertise in the management of arrhythmias. Technicians and clinical physiologists are absolutely vital members of the team, and as well as participating in and contributing to procedures, provide a critical role particularly in device follow up. They make and implement independent treatment decisions, and there is a strong argument to grade those in charge of busy pacing and ICD clinics as consultant physiologists.

The Fifth report suggests that each tertiary centre should have 25 trained technicians, rising to 29 by 2010. Three of four of these, working in pacing and electrophysiology should be at the highest grade, supervising appropriate numbers of technicians within their departments.

NURSES

There are relatively few specialist electrophysiology or arrhythmia nurses, and their input to arrhythmia services in general has been rather sporadic because of this. Appropriately trained nurses can contribute eg to ICD support, to preadmission clinics for ablation, to heart failure & CRT follow up, to falls & syncope clinics, to tilt testing, to arrhythmia clinics etc.

A key role of electrophysiology and ICD nurse specialists is to support patients who have had an ICD discharge. This will save hospital admissions, and should help these posts pay for themselves over time.

GENERAL PRACTITIONERS WITH A SPECIAL INTEREST

The field of arrhythmias provides a perfect opportunity for the general practitioner with a special interest in cardiology. Atrial fibrillation for example is a common problem often badly managed. Stroke is such a devastating complication and the risk of it can be very significantly reduced by anticoagulation. Special AF clinics, run in hospitals or in primary care could be used to investigate, anticoagulate and treat patients without referral to an electrophysiologist, except in particular circumstances. Another example of care which could be devolved to those prepared to take an interest in it is the monitoring of patients taking amiodarone. GPSIs with interests in epilepsy are emerging, and it will be a short step to incorportate such staff into a "joined-up" strategy for rapid-access, nurse-led blackouts/T-LOC triage clinics.

ALTERNATIVE WAYS OF WORKING

(i) A survey conducted by BPEG in 2000 suggested that most consultants implanting ICDs were undertaking duties not associated with cardiac arrhythmias, eg general medicine, general cardiology, and that they would be willing to relinquish these duties, to free up time for more arrhythmia work. This survey also showed that disappointingly few specialist registrars were interested in arrhythmia management.

(ii) Pacemaker follow up may become more "automatic" and web or internet based, using technology and expertise provided by pacemaker manufacturers.

(iii) General practitioners with a special interest in arrhythmias should be identified, encouraged and trained.

(iv) Specialist nurses should be identified, encouraged and trained.

(v) Specialist rapid access clinics eg syncope, atrial fibrillation, amiodarone clinics should be developed in primary secondary and tertiary care.

GROWING THE WORKFORCE

IMMEDIATE MEASURES – YEARS 1 - 3

What should be done:

- The NSF should make it clear that arrhythmias are going to receive the emphasis that they deserve. This will motivate, attract and retainstaff.
- Cardiologists currently working in general roles, especially in DGHs settings, should receive support and encouragement to drop general duties, (such as general internal medicine in acute and elective care), and make the time released available for arrhythmia care through establishing pacing services in all DGHs and rapid access ambulatory services for arrhythmias and syncope. ***If patients with arrhythmias and blackouts can be given a very early appointment for a rapid access clinic, many admissions could be avoided.***
- SpRs training in cardiology need encouragement to favour a component of cardiac arrhythmias in their training and ultimate interests. Currently, cardiac arrhythmias are regarded as having and, "uncertain emphasis", and being a "career-gamble". Many more SpRs in cardiology would wish to spend more time honing skills in arrhythmia management, device implantation and follow-up, and even including catheter ablation skills, if there was a clear message from the DoH that these activities are worthwhile and will receive support from PCTs and StHAs, with Government backing.

MEDIUM TERM MEASURES – YEARS 4 - 6

With more time, training and resource, workforce growth can be achieved. Within 4-6 years, there can be more technical staff available to support arrhythmia management. Trainees in cardiology can acquired the skills to provide a Pacemaker Service in DGHs, and train to provide ICD programmes and biventricular pacing for heart failure. These sophisticated services might be clustered in "sectors" of 2 - 3 DGHs to pool expertise and facilities.

What should be done:

- Whereas there will be competing pressures for catheter laboratory space during the first 1-3 years after the NSF Revision, in years 4-6, when it is clearer what case-load and workforce are available, dedicated laboratories for device therapy and complex arrhythmia management, including ablation, can be planned and constructed.
- Each tertiary centre serving a population of 1-1.5 million:
  - Will need a laboratory dedicated to cardiac electrophysiology, and
  - A laboratory dedicated to complex device implantation.
- Each DGH serving a population of 250,000 should have:
  - A laboratory dedicated to device implantation.

In 4-6 years, workforce growth programmes can produce adequate growth in cardiac technical personnel to staff these facilities.

LONG TERM MEASURES – YEARS 7- 9

Over 7-9 years, with a monopoly of provision and a monopoly over training, the NHS should be in a very strong position to deliver growth in the workforce at every level.

By 2013 we could expect:

- Elective waiting times for catheter ablation for PSVT that match those for the USA and Western Europe.
- Pacing rates similar to the 900/million currently achieved in Western Europe.
- Dedicated permanent pacing facilities in every DGH supporting at least 2 implanting consultant cardiologists in every hospital.
- Adequately staffed Tertiary Arrhythmia Centres that provide a full range of treatments for all manner of arrhythmias, and are in a position to support the activities in neighbouring DGHs. They should be able to provide:
    - In the order of 150 - 250 ablations for PSVT/AFL/AF per million
    - Local Implantation, leadership and support for ICD programmes delivering 800 ICD implants/million. Although:
        - refinement of current data may disclose the post-infraction
        - groups most likely to benefit from ICDs
        - preventative measures for CHD may further reduce the rate of
        - myocardial infarction and the population at high risk

YEAR 10

Year 10 provides the professional and Government to assess progress and make further plans.

CONCLUSIONS

(i) In order to reach the level of arrhythmia services provided in western Europe, 5 – 6 electrophysiologists per million population are required.
(ii) Each district general hospital should offer a pacemaker implanting and follow up service.
(iii) Each population of 500,000 should have an ICD implanting and follow up service.
(iv) This does not allow for any significant increase in service provision, other than to increase the number of pacemakers implanted.
(v) The development of CRT will require a further increase. Appropriate centres should be encouraged to develop cardiac resynchronisation therapy.
(vi) The development of AF ablation will require another further increase.
(vii) Development of specialist clinics with the involvement of GPSIs, nurses and technicians would improve care.

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