PRACTICE REVIEWED

Survey of the attitudes of British physicians to pacing

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Abstract

Objectives—To assess how the opinions of cardiologists, physicians, and general practitioners on the indications for permanent pacing compare with published guidelines, and to determine whether resources, pacing experience, and position influence referral practices.

Design—Anonymous postal survey by questionnaire from St Bartholomew's Hospital, London and the King's Fund Institute, London. The questionnaire established the respondent's position, resources, and previous pacing experience. Eleven clinical and electrocardiographic situations were described and respondents were asked to decide on whether pacing was indicated. The responses received were compared with the guidelines provided by the 1984 American College of Cardiology/American Heart Association task force.

Participants—The 630 members of the British Cardiac Society, 1370 randomly selected general physicians, and 2000 general practitioners.

Results—Patients with symptoms were more likely to be referred for pacing than symptom free patients regardless of underlying aetiology. In relatively symptom free patients the frequency with which pacing was recommended was low, even when it was unequivocally indicated on prognostic grounds. Failure to recommend pacing was unrelated to diagnostic facilities or referral difficulties. Respondents with pacing experience were more likely to recommend pacing.

Conclusions—The physicians surveyed had a conservative approach towards recommending pacing. Most physicians were influenced predominantly by symptoms and the prognostic indications for pacing were not well appreciated.

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The considerable technical improvements in permanent pacing since its introduction in the 1950s have made this procedure one of the most reliable and cost effective forms of medical management. Successive world surveys, however, have shown the rate of implantation of pacemakers in the United Kingdom to be well below that of the rest of western Europe and the United States.^{1,2}

The current United Kingdom rate of

implantation is less than 200 per million of the population per year compared with 450 in the United States and over 500 in parts of western Europe. Although it may be argued that other countries overpace it has been estimated on the basis of prevalence of disease that in the United Kingdom permanent pacing is indicated on prognostic or symptomatic grounds, or both in over 350 patients per million of the population per year. Regardless of symptoms, acquired complete heart block unpaced is associated with a 50% mortality in the first year³ compared with a 90% survival if paced.⁴ This increase in mortality is unrelated to whether the block is intermittent or established.⁵

Although there is no gold standard dictating the indications for implantation of pacemakers, the 1984 American College of Cardiology/American Heart Association task force recommendations,⁶ updated in 1991,⁷ provide accepted guidelines. These guidelines were specifically designed to reduce the incidence of overpacing in the United States and are more conservative than the recently published British Pacing and Electrophysiology Group guidelines on pacemaker selection.⁸ Clinical situations are divided into three classes on the basis of symptoms and electrocardiographic findings (appendix 1). Pacing is unequivocally indicated in class I conditions whereas in class III conditions there is agreement that pacemaker implantation should not be undertaken. In both these groups the decision to pace or not is clearly defined on prognostic or symptomatic grounds and regional variations in pacing practice should not be expected. Conversely, in class II situations, pacing is not a universally accepted form of management and hence divergence of opinion on the need to implant might reasonably be expected.

The purposes of this study were twofold: firstly to establish whether cardiologists, hospital physicians, and general practitioners recognised those conditions in which pacing is the recommended form of management; and secondly if the availability of resources or previous experience influenced the decision to recommend pacing.

Methods

In February 1987 questionnaires were posted to 2000 general practitioners, 1370 hospital physicians of registrar status and above, and to the 630 members of the British Cardiac Society. The general practitioners and hospital physicians were randomly selected from

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the total national registry. Two reminders were sent to those failing to respond. All replies received by the analysis centre (Kings Fund Institute) were anonymous. Three main sections were included in the questionnaire. The first concerned demography, resources, and training of the respondents. In the second part understanding of the practical implications of cardiac pacing was assessed. A range of possible answers was presented for each of nine questions (appendix 2) and the respondents were asked to select the one they considered most appropriate. In some questions a range of answers was accepted as the correct response. The third section presented 11 clinical situations and asked if the respondents considered that permanent pacing or further investigation with a view to pacing was indicated. In this section general physicians and members of the British Cardiac Society were presented with symptoms and details of the electrocardiographic findings whereas general practitioners were given symptoms and recorded pulse rate. One case (6), which was a symptom free patient with an abnormal electrocardiogram, was not presented to the general practitioners. The situations presented were constructed such that the influence of a patient's symptoms, existing electrocardiographic changes, and prognostic features on the respondent's decision could be assessed relatively independently. It was stated in the questions that the patients were otherwise well and assumed that no extenuating circumstances, including neurological causes of syncope, prevailed. Appendix 3 outlines the cases presented and grades each according to the American College of Cardiology/American Heart Association task force recommendations. A final supplementary section was included to determine the personal characteristics of the respondents and hence to determine if a representative sample had been surveyed.

In four of the presented cases (1, 6, 9, and 11) the tendency of the respondents to recommend permanent pacing was analysed with respect to the respondents' current position, age, previous experience, and availability of resources.

Univariate analysis was undertaken with the χ^2 test. Significance was taken at the 5% level.

Consideration was given to sending each respondent an individual copy of the study results, but to reduce costs it was decided to communicate results through presentation at meetings and in publications such as this.

Results

SECTION 1

A total of 2065 (52%) replies were received from 54% of general physicians, 48% of Cardiac Society members, and 49% of general practitioners. Of those who replied 63% of general physicians and 88% of Cardiac Society members were consultants and 30.4% of general practitioners had a hospital attachment. Of those physicians who did not belong to the British Cardiac Society 12.5% had a special interest in cardiology and 11.8% had previously implanted permanent pacemakers. Analysis of the final supplementary section on respondents' characteristics suggested that the sample was representative of the total medical community in terms of age and training.

Cardiac Society members and hospital physicians had ready access to 24 hour electrocardiographic recording but few general practitioners had this facility. Standard 12 lead electrocardiograms were uniformly available. Only a few (6.5% hospital doctors, 5.3% of Cardiac Society members, and 4.2% of general practitioners) had experienced difficulties in referring their patients for pacing. Such difficulties were unrelated to

Figure 1 Individual cases are presented out of order to allow grouping according to American College of Cardiology/American Heart Association task force class (ACC/AHA) and symptoms. On the actual questionnaire the order was deliberate such that no trend was apparent. BCS = British Cardiac Society member; ECG = electrocardiogram; G Phys = general physician; GPs = general practitioners.

geographic area (urban or rural), to Health Service region, or to distance from the pacing centre.

SECTION 2

Although few had experience in permanent pacing, general physicians and general practitioners showed a good understanding of the practical implications of pacing. Of the respondents 84% knew the approximate cost of a pacemaker, 95% the duration of the procedure, 98% the hospital stay involved, 93% the life expectancy of a pacemaker, and 82% the frequency of routine follow up.

Over estimation of the complexity of the procedure was the most common misconception. A sizable minority (41% general physicians, 25% Cardiac Society members, and 52% of general practitioners) estimated the mortality of the procedure to be 0.5% or greater (correct figure less than 0.1%). Indeed over 16% of general practitioners estimated mortality to be 1% or greater. Similarly 24% of general physicians, 18% of Cardiac Society members, and 32% of general practitioners thought that implantation of pacemaker involved a thoracotomy on 5% or more occasions (current figure less than 1%).

Although pacemakers are almost always implanted under local anaesthetic, 20% of general physicians, 10% of Cardiac Society members, and 24% of general practitioners thought that a general anaesthetic was routinely necessary. Oral isoprenaline, con-

sidered by most authorities to be an obsolete treatment, was used on occasion as long term treatment by 31% of general physicians, 14% of Cardiac Society members, and 17% of general practitioners.

SECTION 3

Figure 1 shows the response of each group to the clinical cases.

Class I

There were six cases in which implantation was clearly indicated. When symptoms were associated with documented electrocardiographic changes (cases 7, 4, and 8) 90% or more of all groups recommended pacing. In those cases in which pacing was undoubtedly indicated on prognostic grounds but in whom symptoms were mild or electrocardiographic changes transient (cases 2, 11, and 1) there was a considerable reduction in the frequency of recommendation of a pacemaker. In these three cases the members of the Cardiac Society were significantly more likely to recommend pacing than general physicians. Less than 50% of all respondents (52% of hospital doctors, 81% of Cardiac Society members, and 40% of general practitioners) recommended pacing in a young patient with intermittent heart block and a syncopal episode (case 1). Over 40% of general physicians did not consider that pacing was indicated in an 85 year old lady with mild symptoms but persistent heart block and a broad complex escape rhythm of 35 beats per minute (case 11).

Figure 2 Percentage of respondents in each group recommending pacing for the selected cases analysed according to prior pacing experience. Abbreviations as for fig 1.

Figure 3 Percentage of respondents recommending pacing according to age for the four analysed cases. In case 11, where a high percentage agreed that pacing was indicated, and in case 6 where pacing was not indicated then age has no effect on the respondents' tendency to pace. In the other two cases younger general physicians and members of the Cardiac Society were significantly more likely to recommend pacing. Abbreviations as for fig 1.

Class II

Although pacing in cases 3, 5, and 9 is clearly a therapeutic option few respondents considered pacing appropriate although there was some divergence of opinion. In the symptom free 25 year old with frequent sinus pauses of 5 seconds only 23% of general physicians and 25% of Cardiac Society members recommended pacing whereas 66% of general practitioners considered that it was indicated.

Class III

Only a few respondents from each group recommended pacing in these cases (6 and 10).

SUB-ANALYSIS

In four cases (1, 6, 9, and 11) the influence of the respondents resources, knowledge, and experience on their decision was analysed in detail.

Resources

The respondents' region, distance from pacing centre, and prior difficulties of referral had no influence on their tendency to recommend pacing. Access to diagnostic facilities (standard 12 lead and ambulatory electrocardiography) was unrelated to the respondents' decision.

Knowledge

Significantly fewer of the respondents who believed that a general anaesthetic was routinely required appropriately recommended pacing compared with those who appreciated that the procedure was undertaken under local anaesthetic ($p < 0.05$ in

case 1 for general physicians and Cardiac Society members and in case 11 for general physicians and general practitioners).

In case 11 general practitioners who overestimated the operative mortality were significantly ($p < 0.0001$) less likely to recommend pacing, but otherwise perceived mortality did not influence the respondents' decision.

Respondents' knowledge of the cost of a pacemaker, duration of hospital stay, or frequency of follow up was also unrelated to their recommendation to pace.

Those general physicians who used long acting isoprenaline were significantly less likely to recommend pacing in cases 1, 9, and 11 and Cardiac Society members who used this drug recommended pacing less often in cases 9 and 11 ($p < 0.05$).

Experience

Prior pacing experience was the predominant feature in influencing the respondents' decisions. In each group of doctors those with prior experience were more likely to recommend pacing (fig 2) in all class I and II cases. Age was not a relevant factor among general practitioners and only in cases 1 and 9 were older and more senior physicians or Cardiac Society members less likely to recommend pacing (fig 3) than their younger colleagues.

Discussion

Despite the slowly increasing incidence of pacing in the United Kingdom, the most recent survey of European countries showed that only Greece and Portugal implanted fewer pacemakers per head. Why is it that the

United Kingdom has such a low implantation rate?

Failure to diagnose the presence of a conduction disorder may play a part, and greater availability of ambulatory electrocardiography might result in the recognition of more candidates for pacing. Martin *et al* showed that the rate of implantation of pacemakers in a geriatric population was increased fourfold by the provision of ambulatory, 24 hour, electrocardiographic recording.⁹ The recognition of notable bradycardiac is of little relevance, however, unless there is a commitment to proceed with pacing. In the study of Martin *et al*, implementation of ambulatory electrocardiography coincided with increased cardiological input.⁹ In our survey diagnostic facilities were readily available, but as frequency of use was not assessed it is impossible to exclude under diagnosis.

Financial restrictions may be relevant but such restrictions affected only the implantation centres at the time of the study and should not have directly reduced the rate of referral of patients from the community. It is encouraging that only 5% of doctors had experienced any difficulty in referring patients for cardiac pacing and that these respondents still recommended pacing as often in the cases presented.

If diagnosis and acceptance of referral is not a problem then a further explanation might be that those physicians responsible for the initial management of patients with bradycardiac and conduction disorders consider that the procedure is associated with excessive morbidity or are reluctant to recommend pacing for its own sake. The respondents were almost uniformly aware of what permanent pacing involved for the patient and it is unlikely that low referral rates for pacing reflect misconceptions regarding cost or associated morbidity or mortality.

An alternative explanation, proposed by Rickards in 1984, is that conservatism of the medical profession greatly limits the number of pacemakers implanted.¹⁰ Review of figure 1 shows that few respondents would have considered pacing those patients with class II indications. Although it might be argued that pacing is not unequivocally indicated in these patients it is of note that those physicians who did not recommend pacing were significantly more likely to use long term oral isoprenaline. It is to be hoped that this unsatisfactory and inadequate treatment is not being used routinely in the management of bradycardia in preference to pacing.

Even in those cases with class I indications many respondents did not recommend pacing. Only in those cases where there was unequivocal evidence of sinus or conduction abnormality and frequent symptoms was there almost unanimous agreement on the need for pacing. All groups of respondents were less likely to recommend pacing in patients with prognostically important conduction defects but few symptoms. Regardless of symptoms, unpaced acquired complete heart block is associated with a 50%

Percentage of respondents recommending pacing for complete heart block

Case No		Hospital doctors	BCS	General practitioners
1	Intermittent, symptom free	51.9	80.9	40
4	Elderly, symptomatic	94.2	92.7	89.2
6	Young, symptomatic	97.0	96.0	99.0
10	Elderly, few symptoms	55.8	72.3	78.8

BCS, British Cardiac Society.

mortality in the first year³ compared with a 90% survival if paced.⁴ This increase in mortality is unrelated to whether the block is intermittent or established.⁵ Yet more respondents recommended pacing a 50 year old with recurrent syncope because of sinus bradycardia and pauses (a relatively benign condition) than a 55 year old with intermittent complete heart block and a single episode of syncope. Overall the number of respondents recommending pacing for patients with complete heart block (table) was low suggesting that the poor prognosis of this condition is not widely appreciated.

Those respondents with prior pacing experience were significantly more likely to recommend pacing in those patients with prognostic indications but few symptoms. Of the general physicians surveyed 88% had no experience of permanent pacing although it is these physicians who are regularly responsible for the initial assessment of patients with bradycardias and syncope.

These findings support the contention that there is a conservative approach towards pacing in the United Kingdom and that it may be this rather than inadequate provision of diagnostic and therapeutic resources that has resulted in the low incidence of cardiac pacing. Unfortunately it is also apparent that the prognostic indications for pacing are not appreciated raising the concern that bradycardia support is being denied to those patients at risk of developing asystole.

In the United States the previous excessive level of pacing has been reduced partly through the introduction of peer review panels.¹¹ Although it is more difficult to detect underpacing than overpacing, the introduction of a regular audit of regional pacing levels in this country might encourage a critical review of pacing policies and reduce the considerable regional variations that currently exist.

Education of general physicians, emphasising the indications for and the cost of and risk benefits of pacing, is required. Alternatively, patients considered for pacing should only be managed by those physicians with an interest and experience in pacing. In several cases the appointment of a cardiologist to a health district has dramatically increased the number of implants per year,¹² an increase that has been sustained. Such examples are isolated and will continue to be so while pacing services remain centralised with the initial management of cardiac problems the responsibility of physicians not trained in cardiology.

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Appendix 1: An outline of the American College of Cardiology/American Heart Association guidelines on indications for cardiac pacing

- CLASS I
Symptomatic second or third degree heart block, whether intermittent or persistent. Sinus node dysfunction with documented symptomatic bradycardia.
- CLASS II
Symptom free second and third degree heart block with ventricular rates greater than 40 beats per minute. Bi or trifascicular block with symptoms but not unequivocal association. Sinus node dysfunction where the association between symptoms and bradycardia has not been documented.
- CLASS III
First degree heart block and symptom free Mobitz I. Fascicular block without symptoms or additional atrioventricular block. Symptom free sinus node dysfunction or sinus node dysfunction when symptoms have been shown not to coincide with a bradycardia.

Appendix 2: Questions regarding practical aspects of pacing—section B

- 1 How much does a standard demand pace-maker cost?
£100 £500 £1000 £5000 £10,000
- 2 Is a permanent pacemaker usually implanted under:
General anaesthetic Local anaesthetic
- 3 How long does a straight forward permanent pacemaker by an experienced operator take?
30 min 60 min 120 min 180 min 240 min

- 4 Nationally, what percentage of permanent pacing implants require a thoracotomy?
1% 5% 10% 20% 50%
- 5 In most centres, how long does the patient stay in hospital after straight forward implanta-tion (assuming there are no other or social prob-lems)?
1 day 2 days 5 days 10 days 20 days
- 6 What is the hospital mortality associated with a pacemaker?
0.1% 0.5% 1% 5% 10%
- 7 On average, how long would you expect a pacemaker to last?
1 year 5 years 10 years 20 years 40 years
- 8 Do you ever use long-term drug treatment, eg show release isoprenaline for heart block or other bradycardias?
Yes No
- 9 How often are stable paced patients seen for routine follow up?
Weekly Monthly 3 monthly
6 monthly Yearly

Appendix 3: The clinical cases are listed: although displayed here in their classifica-tion groups they were presented in the questionnaire randomly, as indicated by the case numbers

CASE NO AND DESCRIPTION	ACC/AHA class
Pacing definitely indicated	
Case 7 48 year old with recurrent syncope and broad complex heart block (rate 30/minute).	I
Case 4 95 year old with recurrent faints/falls and heart block (rate 35/minute).	I
Case 8 60 year old with frequent syncope, sinus pauses of 5 seconds.	I
Case 2 50 year old man with a single syncopal episode, sinus bradycardia (50 to 60/minute) and several asystolic pauses of up to 5 seconds.	I
Case 11 85 year old woman with persistent heart block (35/minute, broad QRS). Occasional mild dizziness.	I
Case 1 55 year old man with a single episode of symptomatic broad complex complete heart block, now normal conduction and no symptoms.	I
Pacing optional	
Case 9 61 year old male with occasional syncopal spells. Electrocardiogram shows bifascicular block.	II
Case 5 34 year old with congenital heart block normal QRS complex (rate 45/minute).	II
Case 3 25 year old with no symptoms but frequent long sinus pauses (5 to 6 seconds).	II/III
Pacing not indicated	
Case 6 Asymptomatic 52 year old with trifascicular block (PR = 0.24, right bundle branch block, left axi deviation of -60°).	III
Case 10 18 year old girl with 3 short syncopal episodes. Normal electro-cardiogram.	III
ACC/AHA = American College of Cardiology/ American Heart Association task force class.	