

## Clinical Topics

# Cardiology in a district hospital

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### Abstract

**During 1975-81 a non-invasive cardiac unit was established at St Peter's Hospital, Chertsey, a district hospital serving a population of 202 000. There was a progressive increase in outpatient referrals in cardiology, and in 1981 non-invasive investigations included 424 echocardiograms, 305 exercise electrocardiograms, 275 ambulatory electrocardiograms, and 147 thallium-201 studies. Between 1979 and 1981, 151 patients were admitted directly to major centres for further investigation; 74% of those with ischaemic heart disease and 68% of those with valvular heart disease subsequently underwent surgery, a ratio of investigation to surgery that is half the norm for the four metropolitan regions. Based on the 1981 figures, which were substantially above those for 1980, there is a need for a minimum of 270 open heart operations per million of the population including 180 vein bypass operations. This figure for bypass grafting is 230% higher than in the United Kingdom as a whole in 1978 and has substantial implications.**

### Introduction

At present in the United Kingdom more people die from cardiovascular disease than from all other causes put together. In 1979, 26.2% of all deaths were certified as being from ischaemic heart disease and its consequences, a substantial proportion occurring before the normal age of retirement.<sup>1</sup> The success of coronary artery bypass grafting in the relief of symptoms and improvement in prognosis<sup>2-4</sup> has greatly widened the need for cardiological services, and a substantial increase in candidates for surgery is to be expected. The United Kingdom is ill-prepared for such an increase. Ninety of the 199 health districts before the 1982 reorganisation had no cardiologist or physician with a special interest in the subject, the United Kingdom having fewer such specialists than any other country of the EEC apart from Eire and only one-twelfth of the number per head of population of the United States.<sup>5</sup> These deficiencies might have remained unimportant if investigative and therapeutic techniques had not progressed so substantially. The past two decades have seen the introduction of external cardiac massage,<sup>6</sup> DC cardioversion,<sup>7</sup> and coronary care,<sup>8</sup> and the techniques of electrocardiography, echocardiography, and 24-hour ambulatory monitoring have permitted increasingly precise assessment in suitable units removed from the major centres, as the Joint

Cardiology Committee of the Royal College of Physicians of London and the Royal College of Surgeons of England had suggested.<sup>9</sup> We examine the commission of such a unit and relate the early experience gained in it.

### The health district and its hospital services

North-west Surrey District has a population of 202 000. Demographically it has a higher proportion of social classes I and II and a younger mean age than the national average. It is one of the 13 districts of the South-west Thames Regional Health Authority, which is responsible for a population of 2 957 500. Primary health care is delivered by some 120 general practitioners, many of whom work in purpose-built health centres.

### DEPARTMENT OF MEDICINE

The department of medicine is based at St Peter's Hospital, Chertsey. There are four physicians with on-call responsibility for general medicine. Owing to ward closures the department has only 82 acute beds (66.7% of the regional norm), of which four are in the coronary care unit. This has contributed to lower numbers of acute admissions (2778 in 1981) and a shorter mean stay time (nine days) than the national average for general medicine.<sup>10</sup> Until 1975 there was no physician with special interest in cardiology in the district, although a visiting cardiologist saw 2-3% of the new outpatients. At that time a coronary care unit was planned and equipment available consisted of two single-channel electrocardiographs and one DC defibrillator. There was one cardiographer and no facilities for investigation. To evaluate the effect of the appointment, the inpatient, outpatient, and investigative activities of the new department were examined over the period during which it evolved, together with the pattern of referral for further investigation.

### INPATIENT SERVICES

In 1981, 786 general medical and cardiological patients were admitted by the cardiovascular unit, representing 26.7% of all medical admissions to the hospital. General medical emergencies are admitted on a one-in-four basis, but numbers are increased by transfer of patients from other physicians, by direct general-practitioner referral, and by admission of postcardiac surgery patients.

### CORONARY CARE UNIT

The coronary care unit was opened in 1976 as an annexe of a medical ward. It has four beds and is equipped with bedside monitors, a central console, a mobile x-ray apparatus with an image intensifier, an echocardiograph, a three-channel ECG machine, a defibrillator, a pressure monitor, and a thermodilution cardiac output computer. The number of admissions remained fairly constant at  $476 \pm 13$  SEM a year between 1976 and 1980 but rose to 523 during 1981. Twenty-two temporary transvenous pacemakers were inserted in that year; 10 permanent installations were subsequently implanted.

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## OUTPATIENT SERVICES

The total number of new outpatients seen a year by the unit rose from 498 in 1975 to 751 in 1981. During this period cardiovascular referrals increased 67% and now constitute 96% of all referrals to the unit. Each has chest x-ray films and an ECG before being seen, and exercise testing, echocardiography, or ambulatory monitoring can be performed on the morning of attendance. No figures are available for general-practitioner referrals of cardiologists to other physicians within the district or to cardiologists outside the district, but informal contact suggests that the numbers are likely to be less than 10% of all and are probably balanced by referrals coming from outside the district. Nevertheless, some of the increase may be accounted for by redistribution from local outpatient clinics and local referral of previously London-bound patients.

## INVESTIGATIONS

The number of special investigations a year is indicated in table I. *Electrocardiography*—Two three-channel automatic machines are

TABLE I—Non-invasive investigations performed in the district 1975-81

	1975	1976	1977	1979	1980	1981
ECG	2750	3995	3985	3924	5419	5338
Exercise ECG	18	130	237	124	177	305
Echocardiography	58	168	271	266	314	424
24-hour ECG	0	0	22	34	142	275
Thallium-201 imaging	0	0	0	0	0	147

used. No reporting or general-practitioner ECG service is available, these practices being considered time consuming and clinically unsound. The number of recordings performed in 1976 is incomplete but was constant for 1977-9, increasing in 1980 by 35% after the employment of a second cardiographer. The figures do not include recordings taken on the coronary care unit or in the accident centre.

*Echocardiography*—A Cambridge six-channel ultraviolet light recorder with Cambridge M-mode echo module is used. Two sessions of technician time were available initially but this was increased to four in 1979. The number of recordings a year increased 152% over four years to 424 in 1981.

*Exercise electrocardiography*—The original system consisted of an Avionics 3000 recorder and an E10 treadmill. This was replaced by the computer-assisted Marquette CASE 12-lead system. Exercise tests are supervised by a house physician with full resuscitation facilities available. The number of recordings rose 135% over the four-year period, although exaggerated in 1978 and 1981 (305 recordings) by research projects.

*Twenty-four hour ambulatory monitoring* began in 1978, but it was not until the appointment of a technician in mid-1980 that systematic screening of tapes was possible. A hybrid system is used, recordings being replayed on an Avionics 660A reel-to-reel system backed by an Avionics 680 data terminal; the signals are interpreted and counted by a Reynolds Pathfinder system. In 1981, 275 recordings were made on two reel-to-reel recorders and one cassette recorder. All reports are generated by and data stored on an Intertec Superbrain 356K microprocessor.

*Nuclear cardiology*—During 1981, 147 thallium-201 myocardial studies were performed; the place of this technique in the district hospital setting will be the subject of a separate report.

## REFERRALS

All referrals for further investigations or surgery are made through the cardiovascular unit and are summarised in tables II and III for the years 1979-81. Patients are placed directly on the waiting list for cardiac catheterisation and surgery, the majority at St Thomas's Hospital, London. After surgery they are returned to St Peter's for convalescence and follow-up, thus reducing to a minimum patient attendances out of the district and postsurgical inpatient time at the regional centre. During 1979-81, 151 patients (excluding those for permanent pacemaking) were referred for further investigation. These were subdivided into ischaemic heart disease (76), valvular heart disease (50), and miscellaneous (25). Of the 76 referred for investigation of ischaemic heart disease, 56 were accepted for surgery, one refused

angiography, and one remains on the waiting list. The coronary angiographic findings are summarised in table IV. Of the 50 patients referred for investigation of valvular heart disease, 34 were accepted for surgery and one refused angiography. The miscellaneous group is shown in table III.

TABLE II—Referral of patients to special centres for angiography with or without surgery

Procedure	1979	1980	1981	Total
Investigation stable angina	10	11	33	54
Investigation unstable angina	4	6	12	22
Coronary artery bypass grafts	9	12	35	56
Investigation VHD	14	17	19	50
Surgery VHD	7	11	16	34
Total No of referrals	28	34	64	126
Total No accepted for surgery	16	23	51	90
Ratio surgery/referral	0.57	0.68	0.80	0.71

TABLE III—Details of the miscellaneous group of 25 referrals to special centres for further investigation, 1979-81

	1979	1980	1981
Electrophysiology	6	0	2
Congenital heart disease	3	0	1
Cardiomyopathy	1	4	0
Pulmonary embolism	0	0	3
Aortic dissection	2	1	1
Constrictive pericarditis	0	0	1
Total	12	5	8

TABLE IV—Severity of coronary artery disease in patients referred for coronary angiography

Disease	1979		1980		1981	
	S	U	S	U	S	U
3v	8	2	8	5	20	9
2v	1	1	2	1	6	1
1v					1	
0v			1		1	
Grafts	1				3	2
Total	10	4*	11	6	33†	12

3v, 2v, 1v, and 0v relate to number of vessels affected.

Grafts refer to blocked vein bypass grafts previously inserted.

S = Stable angina. U = Unstable angina.

\*Includes one catheter death.

†Includes one patient who remains on the waiting list and one who refused investigation.

## STAFFING

The cardiovascular unit is staffed by a consultant, a medical registrar, two house physicians, and two clinical assistants (one session each). In addition there is one senior physiological measurement technician (PMT), one PMT, one cardiographer, and one PMT (four sessions) responsible for echocardiography.

## Discussion

The foregoing data give an indication of the work load of a district hospital cardiac unit. They cover a period of transition from no facilities to the present state of equipment and pattern of referral. The increase in new outpatient consultations has flattened out, but despite the vetting of requests the number of investigations is still increasing. To some extent Parkinson's law applies<sup>11</sup> and requests will fill the technician time available, but at least one whole-time technician, preferably of senior grade, is needed in such a unit to perform some 400 echocardiograms and 300 ambulatory recordings a year.

Of the patients referred for investigation of ischaemic heart disease during 1979-81, 74% were accepted for surgery. Only two patients had normal coronary angiograms. Of the referrals

for assessment of valvular heart disease, 68% were accepted for surgery. Angiography could have been avoided in a few of these patients, and we suggest that evaluation by non-invasive methods can be made with sufficient precision to justify a direct admission policy to a major cardiac centre. Indeed, 71% of our patients investigated for ischaemic or valvular heart disease underwent surgery, whereas in 1978 only 36% of patients investigated in the four metropolitan regions did so.<sup>12</sup>

During 1979-81, the number of patients referred for investigation of ischaemic heart disease increased by over 200%, and is still increasing. The evidence that surgery improves the prognosis of severe coronary artery disease<sup>2-4</sup> is a major factor, but there is increasing awareness of the benefits of surgery on the part of general practitioners and to some extent on the part of the patients. Based on our 1981 figures, after allowance for patients waiting to be investigated, there appears to be a requirement for a minimum of 230 coronary angiograms and 180 bypass graft operations per million of the population a year, although this makes no allowance for the upward trend still evident. This rate for bypass grafting is 90% higher than in the four Thames regions and 230% higher than in the country as a whole in 1978.<sup>12</sup> It coincides with the figure for Australia in 1978, a country of similar ethnic origin with a comparable health care system,<sup>13</sup> but is only half the rate at which the operation was performed in the United States.<sup>12</sup> Over the 1979-81 period the patients referred for valvular heart disease rose 36%, but the overall numbers were small and may represent changes in the local pattern of referrals as there is no evidence that surgery for this condition is on the increase.<sup>12, 13</sup> Nevertheless, based on the 1981 figures and allowing for no further increase, there appears to be a need for not less than 100 invasive investigations and 80 open and closed valvular heart operations, together with 10-20 miscellaneous procedures per million of the population a year. Such predictions based on a rising trend must be treated with caution, but they are in line with both the Australian data and the predictions of the Royal College of Physicians Working Party.<sup>9, 13</sup>

Experience in North-west Surrey suggests a serious underprovision of invasive investigation and cardiac surgery in the South-west Thames region and in the country as a whole. In 1981, 367 open and closed heart operations, including 209 bypass grafts, were performed at St George's Hospital, the only cardiac centre in the region. The prediction for the regional need is for a total of not less than 800 open and closed operations a year, of which 530 would be vein bypass grafts. There is thus a 60% shortfall in the provision of coronary artery bypass grafting and, furthermore, the low number of permanent pacemaker installations may also represent difficulties in regional provision.

It is beyond the scope of this paper to discuss remedies but some points are worth noting. Based on our observations, there is such a gross underprovision of cardiological care in the United Kingdom at present that if the North-west Surrey experience were to be repeated on a national basis, facilities for cardiac catheterisation and surgery would have to be more than doubled. In the current no-growth situation in the NHS many patients annually will thus inevitably be denied the modern treatment that brings effective symptomatic relief and which for some is life saving.

And yet, as Chamberlain<sup>5</sup> has pointed out, there is a paradox. In 1980, 63 senior registrars were training in adult cardiology with the prospect of six posts a year for the next 10 years becoming available. In 1981, however, five posts for physicians with special training in cardiology fell vacant but only two were filled. One problem is the divergence between the full-time cardiologist working in a major centre and the physician cardiologist often working in isolation at district level. The latter may not be a member of the British Cardiac Society and is poorly represented on the Council of the Cardiac Society and on the Cardiology Committee of the Royal College of Physicians of London. This leads aspiring young cardiologists to elect for "proper" cardiology when many are needed throughout the

country at local level. It also encourages the establishment of posts funded by charitable or other sources, and this has further distorted the training ladder. If the recommendations of the Joint Cardiology Committee<sup>9</sup> relating to subsidiary cardiac units were to be implemented each health district would have one or more physicians trained in cardiology and non-invasive facilities for investigation. With the modern techniques available, these units working closely with a major centre should be able to make a substantial contribution to the care of patients in the United Kingdom. To bring this about, a considerable change in direction will be needed.

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*In an overseas (Kenya) hospital without facilities for endoscopic resection hypertrophied prostatic tissue is still enucleated. A balloon catheter is passed through the urethra into the prostatic bed; at the same time a further catheter is inserted suprapubically so that the bladder can be irrigated with sterile physiological saline. Is there any danger of any of this salt solution being absorbed?*

The danger of absorption of saline used as postoperative irrigation after prostatectomy should be minimal. The amount of fluid absorbed via the transurethral epithelium of the intact bladder wall is negligible. The bed of the prostate from which the adenoma has been enucleated may provide a surface from which some saline can be absorbed, but the amount would be so small as to be unrecordable by any known means. If, on the other hand, inadequate haemostasis had been achieved, and the prostatic venous sinus was still open, a high pressure (more than 60 cm water) irrigation could force saline into the circulation. Also absorption could occur as a result of any extravasated saline that may leak from an inadequately sutured prostatic capsule. These routes of absorption can occur only when the intravesical pressure rises as a result of a blocked catheter and should all be safely controlled by careful supervision of the drainage catheter.—J P MITCHELL, honorary professor of surgery (urology), Bristol.