

designed to build up research skills. They are designed to reimburse the infrastructure costs to those who have already acquired research skills and are now actively undertaking research and are having their work published in the major peer-reviewed literature. Thus the criteria hinge critically on successful publication and a demonstrated competence in the research world with its special demands.

Of course, research practices must also have certain characteristics, such as good practice management, a sophisticated computer system and a wide range of applications of age-sex registers and diagnostic registers, so that they are easily able to examine the important day-to-day clinical issues facing doctors in 'the front line of a National Health Service'.<sup>12</sup> The criteria stipulated by both the RCGP and the South and West Regional Health Authority are very similar.

Among the 12 general practitioners currently appointed are several with higher university degrees, including one who was awarded the Raymond Horton Smith prize for the best MD thesis of his year at the University of Cambridge. In the South and West Regional Health Authority a small minority hold double memberships of the Royal College of Physicians and the RCGP. They have between them achieved a substantial range of publications, particularly in this *Journal* (previously the *Journal of the Royal College of General Practitioners*) and the *British Medical Journal*. Their interests range widely, from coronary heart disease and hypercholesterolaemia (in physical medicine) through maternity services, to psychosocial medicine (including social deprivation). These doctors are spread over a wide geographical area and include those practising in inner cities and those in remote rural areas. Many will choose to link with university departments of general practice; several have already done so and are being warmly welcomed. However, those who wish to undertake research alone will be free to do so.

The most appropriate level of payment is not yet known, as the true costs of infrastructure support for this kind of work have never been published. In the meantime, the south and west region is paying £12 500 a year to each of these practices for three years, subject to annual review. This will also be the rate for the RCGP research practices being advertised in 1995.

The 12 general practitioners already working in the research practices are being given this new resource to provide support and infrastructure, particularly in the pre-protocol phase of research application. It is now up to them to seek their own research funding from wherever they choose. In doing so they will of course be entitled to describe themselves as either RCGP research general practices or NHS research general practices of the South and West Regional Health Authority.

This exciting new development will give support and encouragement to a wide range of health care professionals, because all these doctors work with colleagues in primary health care teams.

The impact will therefore be magnified, in a form of academic gearing, particularly if the RCGP and south and west region continue their programme of appointments as is hoped over the next three years.

Already there are discussions about ways of grouping the research practices together into what may in effect become a new form of research network, which should enable them to share ideas, support each other and develop even further.

The real issue is whether or not other regional research directors in England will follow this interesting example and whether or not it will be followed by others in Scotland, Wales and Northern Ireland, where interest has already been expressed. It will be the RCGP's policy to encourage them vigorously to do so.

Research general practices are a new idea and mark a new policy shift of the NHS as it moves towards a 'primary care-led' NHS.<sup>13</sup> Research general practices convert a great historical tradition into a new organizational entity, appropriate for the 21st century.

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# Investigation in general practice of patients with suspected heart failure: how should the essential echocardiographic service be delivered?

**H**EART failure is a life threatening disorder that affects between 0.4% and 2% of the general population and up to 10% of elderly subjects in Europe and North America.<sup>1-3</sup> Annual mortality exceeds 60% in severe cases,<sup>4</sup> and the five-year mortality approaches 50% in milder cases.<sup>5</sup> These rates are as high as

for many forms of cancer. The morbidity caused by heart failure is reflected in the workloads of both the hospital service and general practice: there are 120 000 hospital admissions per year (5% of all admissions to adult medical and geriatric wards),<sup>6-9</sup> and it is estimated that for each hospital admission 14 consulta-

tions take place in general practice.<sup>3</sup> The cost to the National Health Service is considerable: £360 million a year is spent on the management of heart failure, and 60% of this goes on hospital treatment alone.<sup>10</sup> In several large trials angiotensin-converting enzyme (ACE) inhibitors have been shown to reduce mortality and also to improve symptoms and quality of life.<sup>4,11-13</sup> These drugs are now licensed for use in general practice, where considerable marketing pressure is being applied.

In the United Kingdom most patients with heart failure are treated by general practitioners.<sup>3</sup> An audit of six general practices in the Nottingham health district found that only about half of the patients who had been prescribed loop diuretics fulfilled the diagnostic criteria for heart failure.<sup>14</sup> Echocardiography had been performed in fewer than a third of cases in this survey and only 17% of patients with heart failure were receiving ACE inhibitors. This medication had been started by hospital physicians in nearly all cases. These observations and a recent study from Liverpool<sup>15</sup> suggest that the diagnostic facilities necessary for optimal management of heart failure are not available to, or used by, general practitioners.

In common with other doctors, general practitioners suspect a diagnosis of heart failure when patients present with dyspnoea or oedema. When these symptoms are combined with signs of a raised venous pressure or pulmonary congestion, clinical diagnosis is usually not difficult. None of these clinical features is specific to heart failure, however, and some of the important supporting evidence for the diagnosis (cardiac enlargement or the presence of a third heart sound) may be difficult to detect or may be masked by other diseases.

Coexisting conditions which cause symptoms that are similar to those of heart failure are more common in patients with pulmonary disease or in elderly patients. In such cases the clinical evidence available to the general practitioner is not sufficient to determine the extent to which heart failure may be causing the symptoms. Without echocardiography it is also difficult to determine the severity of impairment of ventricular function. Furthermore, general practitioners often see patients in the early stages of disease before the more florid features have developed.

The presence of a systolic murmur in a patient with heart failure invariably requires an echocardiographic and Doppler study to investigate the differential diagnoses of aortic stenosis, aortic sclerosis, and primary mitral regurgitation or secondary mitral regurgitation, and to determine whether or not the patient needs valve surgery. The diagnosis of mitral stenosis and pericardial disease can also prove difficult and both conditions may require surgery rather than medical treatment. The serious implications of a diagnosis of heart failure and the established benefits of appropriate medical and surgical treatment mean that all patients in whom the condition is suspected<sup>14</sup> require an accurate diagnosis.

The contributions of the chest x-ray and electrocardiogram to the diagnosis and assessment of severity of heart failure are limited. Haematological and biochemical investigations should be used to detect anaemia and thyroid dysfunction, and to measure urea and electrolytes. None of these investigations establishes the diagnosis, however, and only rarely indicates a cause of heart failure. The recent discovery of the natriuretic peptides and the development of simple, cheap radioimmunoassay techniques to measure their concentration in peripheral blood promises to be an important development.<sup>16</sup> The presence of a raised concentration, particularly of the B-type natriuretic peptide, has been shown to provide a sensitive indication of left ventricular dysfunction. We do not know how useful this will be, but it could lead to a simple screening test that general practitioners might use to select patients who need further investigation or treatment.<sup>16</sup>

The most appropriate initial investigation for patients with heart failure is echocardiography combined with Doppler studies. This investigation will confirm left ventricular dysfunction as the cause of a patient's symptoms. In patients with symptoms of breathlessness who do not have heart failure, the echocardiogram may show normal ventricular function and thus avoid inappropriate treatment with ACE inhibitors.

The echocardiographic examination should be performed with high resolution equipment, configured for cardiac use. It should show the left ventricular endocardium in detail and have appropriate analysis features to allow quantification of ventricular volumes and ejection fraction. A high quality videotape recorder should be used to store real-time (moving) images to allow future comparison and further advice/discussion, and for medicolegal purposes. The quality of the echocardiographic equipment should be high enough to permit detection and visualization of common co-existing pathological features, such as left ventricular mural thrombus.

The echocardiographic equipment must also incorporate Doppler facilities, preferably including colour flow mapping. The haemodynamic information obtained from Doppler imaging, coupled with the anatomical and functional data from the cross-sectional images, allows identification of structural causes of heart failure, quantification of the severity of valve lesions, and assessment of diastolic left ventricular function.

Access to quality echocardiographic equipment with appropriate facilities is, however, only one component of accurate cardiac ultrasound. The technique requires an operator with considerable expertise and experience to obtain and interpret the data. In 1994, the British Society of Echocardiography published recommendations for training and accreditation in echocardiography.<sup>17</sup> The society strongly recommended that all echocardiographic studies should be performed only by individuals with the 'proficiency level accreditation'. Appropriately trained and accredited cardiac technicians may perform the investigation, provided that the study report describes the echocardiographic findings but does not recommend or suggest any particular treatment.

The echocardiographic investigation of a patient with suspected heart failure may be technically difficult. The operator must have the experience and training to recognize that it is inappropriate to make measurements when image quality precludes quantification of left ventricular function. A qualitative evaluation of left ventricular function that will allow management decisions to be made may lie within the ability of an experienced echocardiographer. This makes operator skill and accreditation essential components of the echocardiographic services.

Currently there are too few trained operators to provide this important investigation to the patients who need it. General practitioners should not hesitate to refer appropriate patients so that local hospitals and purchasers are made aware of the need for high quality echocardiographic services.

If general practitioners are to have increased access to echocardiographic investigation for patients with suspected heart failure,<sup>18,19</sup> the equipment and staffing issues must be resolved. This should, in the first instance, be achieved by negotiating open access contracts with local hospital cardiac departments. Some of the funding for this may come from a concomitant reduction in unnecessary chest x-rays or electrocardiographs or both. We will save more if we avoid giving ACE inhibitors to patients who do not require them.

The alternative of transporting complex, delicate electronic equipment to large health centres or small hospitals without such facilities is ill advised. Wider access to a hospital-based service seems to be the option that will provide the best quality equipment and staff.

The demand for echocardiographic investigations for assess-

ment of all types of cardiac disease is increasing rapidly. A recent audit showed that the largest growth in demand was for the evaluation of left ventricular function after myocardial infarction in patients in whom heart failure is suspected.<sup>20</sup> ACE inhibitors should not be prescribed for heart failure by either a general practitioner or a hospital doctor without prior echocardiographic examination. In addition, considerably more general practitioners are requesting echocardiographic services. This increase in demand is both predictable and appropriate. Rigorous debate, careful planning, and education are needed to ensure that the quality of echocardiography and Doppler imaging is not compromised as the volume of investigations increases.

Whatever arrangements are agreed locally, patient care will improve only if a high quality echocardiography service is provided. We await the publication of a position paper by the British Cardiac Society on the subject of diagnosis and management of heart failure.

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