Likelihood ratios should have been given

EDITOR,—A P Davie and colleagues examine the role of electrocardiography in identifying left ventricular systolic dysfunction.¹ While electrocardiography is a useful first line investigation in patients deemed suitable for open access echocardiography, it would be a mistake to recommend it as a useful investigation for all patients with suspected chronic heart failure in, for example, general practice. The problem is not with the validity of Davie and colleagues' results but with their applicability, because of the problems of diagnostic data.²

The key findings relate to the predictive values of electrocardiography in diagnosing left ventricular dysfunction when compared with a chosen reference standard. Predictive values, however, are not constant, changing with the prevalence (or pre-test probability) of the target disorder in patients undergoing investigations. The prevalence of left ventricular systolic dysfunction in Davie and colleagues' study was 17%, which is much higher than the 1-3% quoted for the general population.³ If Davie and colleagues' results are recalculated on the basis of a prevalence of 1% the positive predictive value of electrocardiography plummets to 2.4% and the negative predictive value rises to 99.9% (table 1), suggesting that when the prevalence of an abnormality is low electrocardiography is not useful.

Table 1—Electrocardiographic findings with population prevalence of left ventricular systolic dysfunction of 1%

Electrocardiographic findings	Impaired left ventricle	Preserved left ventricle	Total
Abnormal	94	3762	3 856
Normal	6	6138	6 144
Total	100	9900	10 000

Sensitivity=94%, specificity=62%.¹
Positive predictive value=2.4%, negative predictive value=99.9%.
Likelihood ratio for abnormal electrocardiogram=2.42 and for normal electrocardiogram=0.09.

If predictive values are so variable, how can the results of studies investigating diagnostic tests be better presented? One solution is to use likelihood ratios, stratified by levels of test results when possible.^{4,5} Because likelihood ratios do not change with the underlying prevalence of the target disorder they give a much more stable assessment of an investigation's usefulness in all situations. A simple nomogram that uses pretest probabilities, post-test probabilities, and likelihood ratios is available to help doctors decide whether an investigation is worth while in any patient and can be easily slipped into the doctor's pocket.⁵ Finally, while likelihood ratios can be relatively easily calculated from 2x2 tables, medical journals ought to present them routinely to help doctors decide whether a particular diagnostic test will be useful.

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Courses on interpreting ECGs would improve general practitioners' skills

EDITOR,—A P Davie and colleagues recommend that general practitioners should use electrocardiography as a screening investigation for patients with suspected chronic heart failure; if the result is abnormal the patient should be referred for echocardiography, but if it is normal other diagnoses should be considered.¹ We are not convinced that common abnormalities in electrocardiograms are reliably recognised by general practitioners. The main abnormalities detected in the authors' study included atrial fibrillation, previous myocardial infarction, left ventricular hypertrophy, bundle branch block, and left axis deviation. Studies have shown, however, that many general practitioners and hospital doctors lack the skills to interpret electrocardiograms.^{2,3} In one study in general practice atrial fibrillation was diagnosed by only 65% of respondents, left ventricular hypertrophy by 76%, and left bundle branch block by 66%.² Furthermore, unequivocal acute myocardial infarction was misdiagnosed by 20% of respondents.

If general practitioners miss major electrocardiographic abnormalities they will not refer the patients for echocardiography and may start or continue inappropriate treatment. Correct reporting of electrocardiograms could be achieved if a service for interpreting electrocardiograms existed in local hospitals or if interpretive electrocardiogram recorders were used. Courses on interpreting electrocardiograms might also improve the interpreting skills of general practitioners.

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ECGs are valuable in hospital as well as general practice

EDITOR,—A P Davie and colleagues' study suggests that a normal electrocardiogram virtually excludes chronic heart failure due to left ventricular systolic dysfunction.¹ The study was performed in a general practice setting in patients with chronic, stable heart failure who were referred to an open access echocardiography service. We suggest that the study may simply confirm a long-standing clinical impression and that the authors' finding may also apply to patients admitted to hospital with acute heart failure.

Over the six months March to August 1994 there were 7451 emergency medical admissions to our inner city district general hospital; 348 of the patients (170 male, 178 female; mean age 73.2 (SD 11.2) years) were diagnosed as having acute heart failure. A study of a random sample of 252 admission electrocardiograms showed that 177 patients were in sinus rhythm while 75 were in atrial fibrillation or flutter. Electrocardiographic abnormalities included abnormalities indicating cardiac ischaemia (not including signs of myocardial infarction) in 75 patients, previous or new myocardial infarction in 40, left ventricular hypertrophy in 24, and left bundle branch block (or other conduction abnormalities) in 62.

We did not classify any of the admission electrocardiograms as normal, although the admit-

ting junior medical staff had initially reported the electrocardiogram as normal in eight cases. In these eight patients the electrocardiographic abnormalities were subsequently found to have been misinterpreted or the clinical features were found to be inconsistent with heart failure due to systolic dysfunction (table 1).

Table 1—Electrocardiograms initially reported as normal in patients admitted with heart failure

Case No	Clinical features and other investigations	Comment
1	Atrial fibrillation, chronic renal failure, inferolateral ST/T wave changes	ECG abnormal
2	Chronic renal failure due to severe bilateral hydronephrosis; no evidence of heart failure; normal ECG and chest x ray film	Diagnosis of heart failure doubtful
3	Fatal pulmonary thromboembolism; normal ECG; no evidence of heart failure on postmortem examination	Diagnosis of heart failure doubtful
4	ECG showed left ventricular hypertrophy; echocardiogram showed normal systolic function	ECG abnormal; in view of echocardiographic findings, dysfunction was possible
5	Normal ECG, echocardiogram, and chest x ray film	Diagnosis of heart failure doubtful
6	Normal echocardiogram; peripheral oedema secondary to amlodipine treatment	Diagnosis of heart failure doubtful
7	ECG showed old anterior Q wave myocardial infarction	ECG abnormal
8	ECG showed atrial fibrillation with old inferior myocardial infarction	ECG abnormal

ECG=Electrocardiogram.

We suggest that, as well as general practitioners,¹ admitting junior medical staff should be advised that an electrocardiogram should be recorded in all patients in whom heart failure is suspected, since cardiac impairment is highly unlikely in patients with a normal electrocardiogram. The possibility still remains that some patients with heart failure have normal systolic contraction, the heart failure being due to diastolic dysfunction²; in such cases drugs such as β blockers and calcium antagonists are useful but angiotensin converting enzyme inhibitors are of less established benefit. Echocardiography may be valuable in these instances.

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Learning from primary care in developing countries

EDITOR,—We agree with Paul Johnstone and Isobel McConnan and the subsequent correspondents that Western countries have much to learn from the primary health care systems of the developing countries.^{1,2} Sri Lanka stands out as an example. It has been the policy of successive Sri Lankan governments to provide free health services to all citizens. However, it is estimated that the private sector, which includes Western and indigenous medicine, accounts for 55% of

the patients, who are handled mainly as outpatients. A health care delivery unit can be found on average 1.4 km from any home in the country and a free government Western health care institution 5 km from any patient's home; 93% of the population have access to health services, significantly higher than other countries in the region. There are 246 health units throughout the country responsible for the control of communicable diseases, sanitation, school health work, epidemiological surveillance, family health, and health education.

The first health unit in south east Asia was established in Kalutara, Sri Lanka, in 1926. It has since evolved into the National Institute of Health Sciences, which is responsible for the training of health workers required for the primary health care programme.

Table 1 shows the trend of some health indicators over the past 50 years. In addition, 94% of births now take place in a medical institution. Only 18.7% of newborn infants had low birth weight (below 2.5 kg); 97.3% of children are fully immunised.

Table 1—Health indicators, Sri Lanka

Indicators	1945	1993
Crude birth rate per 1000 population	36.7	19.9
Crude death rate per 1000 population	22.0	5.3
Maternal mortality per 1000 live births	16.5	0.3
Infant mortality per 1000 live births	140.0	18.2
Neonatal mortality per 1000 live births	75.5	13.0

Source: Department of Census and Statistics.

Expenditure on health services is about 4.5% of the entire government expenditure while the amount spent on defence is about 10%. In addition, successive governments have implemented poverty alleviation programmes.

The provision of free education from year one to university in 1945 has raised the literacy rate from 57.8% in 1946 to 87.2% (female literacy 83.2%) in 1981—one of the highest rates among developing nations in the south Asia region. While 60% of the population has access to safe drinking water, 50% has access to sanitation.

The health improvements in Sri Lanka have been achieved not only by improving the curative aspect but also by strengthening the public health services. In addition, infrastructural development, free access to education, and a commitment to an equitable distribution of wealth both in urban and rural areas has also been instrumental in the gains made despite a civil war which has lasted for more than 12 years.

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Training in substance misuse for GPs

Services need to be adequately resourced

EDITOR,—I am sympathetic to Edwin Martin's view that training in substance misuse for general practitioners is lacking.¹ Shared care for drug misuse will fail unless specialists in substance misuse and those working in primary care coor-

dinate their efforts and are trained; a sense of failure and frustration will in turn be transmitted to patients. When shared care works effectively it has a significant effect on harm reduction, including a demonstrable impact on the level of drug related crime in the community.²

Unfortunately, current levels of specialist provision in the management of substance misuse are too low, and specialist training is unevenly developed throughout Britain. The report on the mental health of the nation by the Royal College of Psychiatrists in 1992 identified a need for 0.6 whole time equivalent consultants in substance misuse per 100 000 population.³ The number of consultant sessions in substance misuse needs to increase fourfold if general practitioners are to receive anything approaching a proper level of support and locally based training for this complex task. If the rhetoric surrounding tackling drug problems together is to be given any meaning then the services need to be adequately resourced.

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Courses are available in Lothian

EDITOR,—Edwin Martin comments on the lack of training available for general practitioners who care for drug users.¹ This problem has been addressed in Lothian by the development of "primary care facilitation." The primary care facilitator team works alongside the local drug service to support general practitioners and primary care teams to share the care of drug users. The medical facilitator is a doctor who has worked in general practice and in the drug service. She is helped by a local general practitioner, who works with the team one day a week, and by a nurse facilitator, who trains non-medical members of the primary care team, including nurses and receptionists.

The team runs courses and meetings for general practitioners, nurses, and receptionists; distributes information about drugs and drug services; and visits practices for training based there. We have recently collaborated in the production of a handbook for general practitioners on managing drug users in general practice. A survey carried out by the team last year (with a 100% response rate) found that general practitioners in Lothian were prescribing for 1500 drug users—an increase of 77% since 1991.²

Those aspects of Lothian's approach that have contributed to its success in sustaining general practitioners' involvement in the shared care of drug users have recently been described.³ Although our focus is on general practitioners in Lothian, our handbook and courses are available to general practitioners from elsewhere. Martin has now attended one of our courses.

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**We received four other letters on this subject, giving details of the training that is being developed by Camden and Islington Community Health Services NHS Trust, Brent and Harrow Family Health Services Authority, and Southampton Drugs Advisory Service and in West Dorset.—EDITOR

Methadone maintenance reduces injecting in prison

EDITOR,—HIV can spread rapidly among injecting drug users in prison, even when HIV prevalence is low.¹ Despite this, few countries have implemented HIV prevention measures for inmates and no evidence exists on the effectiveness of such measures in correctional environments. Condoms are provided to inmates in 19 countries and bleach in 13. Methadone is provided to inmates on a maintenance treatment basis in only five countries and for detoxification in a further six countries including England, Ireland, and Scotland.² Calls for policy reform in the United Kingdom have supported the provision of methadone on a reduction regimen for prisoners.³ Methadone maintenance treatment is well known to be effective in community settings,⁴ but its effectiveness in prisons is not known. Therefore we evaluated the effectiveness of methadone maintenance treatment in reducing risk behaviour among prisoners.

In 1993 we interviewed 185 ex-prisoners with a history of injecting drug use in New South Wales, of whom 64 reported receiving methadone maintenance treatment before, during, and after their period in prison; 80 reported receiving no treatment. Injecting drug users who reported receiving methadone maintenance treatment in the three months before prison were significantly less likely to report daily injecting (42% v 60%, odds ratio=0.4 (95% confidence interval 0.2 to 0.9); P=0.03) and syringe sharing (13% v 26%, 0.4 (0.2 to 0.9); P=0.04) than those not receiving the treatment.

Injecting drug users who received methadone maintenance treatment during imprisonment reported significantly fewer injections per week (mean 0.16 v 0.35; P=0.03 Mann-Whitney test) than those not receiving the treatment but only when the maximum methadone dose exceeded 60 mg and if methadone maintenance treatment had been provided for the entire duration of imprisonment.

These results suggest that the reduction of injecting and syringe sharing that occur with methadone maintenance treatment in community settings also occur in prisons. However, inmates need a daily dose of at least 60 mg of methadone and treatment is required for the duration of incarceration for these benefits to be realised in prison. Methadone maintenance treatment has an important role to reduce the spread of HIV and hepatitis in prison.

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