early meningococcaemia clinically, so a vigorous attempt should be made to recover the pathogen.

DAVID HANSMAN

Microbiology Department,
Adelaide Children's Hospital,
North Adelaide,
South Australia 5006

1 Cartwright K, Strang J, Reilly S, White D. Mortality in meningococcal disease. *BMJ* 1992;304:116. (11 January.)

2 Christie AB. *Infectious diseases*. 4th ed. Edinburgh: Churchill Livingstone, 1987:914.

Temporary pacing

SIR,—Adam Fitzpatrick and Richard Sutton make no mention of monitoring a supply of oxygen and resuscitation facilities as being necessary parts of a "suitable environment" for transvenous pacing.¹ In the past few years I have attended three cardiac arrest calls to patients undergoing pacing: in no case was any written record being kept of heart rate, blood pressure, or pulse oximetry readings, and in only one case was oxygen being given. Yet patients with slow heart rates or sick hearts, or both, are likely to have impaired cardiac output and reduced oxygen supply to the tissues.

I strongly recommend that oxygen saturation, pulse rate, and blood pressure are recorded every five minutes for all patients undergoing transvenous pacing (this is becoming standard practice in anaesthesia); there should be a low threshold for giving supplemental oxygen; and emergency drugs, suction equipment, and equipment to intubate and ventilate patients should be immediately to hand.

Transvenous pacing is an operation; a minor procedure can become a major performance if the suitable environment does not include adequate monitoring and resuscitation facilities.

COLM LANIGAN

Department of Anaesthetics,
Hospitals for Sick Children,
Great Ormond Street,
London WC1N 3JH

1 Fitzpatrick A, Sutton R. A guide to temporary pacing. *BMJ* 1992;304:365-9. (8 February.)

Costs of adverse effects

SIR,—Fiona Godlee emphasises the National Radiological Protection Board's concern¹ over the increasing contribution of x ray computed tomography to the total medical radiation dose for the population of the United Kingdom.^{2,4} This runs counter to the general medical perception that advances in equipment and techniques and closer radiological supervision have reduced the radiation dose and that radiological examinations are therefore safer than in the past.

For many clinicians the value of a radiological investigation is measured by the quality and relevance of the information it provides. Computed tomography does well on this scale, but the relatively high radiation doses entailed are not appreciated. A radiological examination is the responsibility of a radiologist and requires close consultation with the referring clinician before it is undertaken.

There are, however, other aspects of the National Radiological Protection Board's reports which should be seen in the context of the recently revised estimates of the risk of cancer associated with low dose and low dose rate whole body irradiation given by the International Commission for Radiation Protection after reappraisal of data from Hiroshima and Nagasaki.³ For both cancer induced by radiation and fatal cancer these are approximately 3.5 times higher than the previously quoted values and are now relevant to the doses received

by patients undergoing computed tomography. From Godlee's figures a computed tomographic scanner in the United Kingdom performs about 3000 examinations a year. At an average dose of about 5 mSv per examination this gives a total population dose of 15 person Sv. The costs of the adverse effects of this in fatal cancer induced by radiation have been calculated at roughly £150 000 a year, giving a total cost of £30m for the 200 scanners in the United Kingdom. The additional costs of non-fatal cancer induced by radiation have been calculated at 1.5 times greater than this. Furthermore, no account is taken of the additional risks of cancer and costs in children.

These costs of cancers and deaths induced by radiation are concealed and therefore do not feature in calculations of the revenue consequences of a computed tomography service. They are also ignored when the costs of computed tomographic and magnetic resonance scanners are compared, greatly to the detriment of magnetic resonance scanners. Were they more generally appreciated they would provide a strong incentive for district general hospitals to acquire magnetic resonance scanners. Britain lags even further behind other developed nations in its provision of magnetic resonance scanners than it does in its provision of computed tomographic scanners.

PETER COOK

Wessex Neurological Centre,
Southampton General Hospital,
Southampton SO9 4XY

1 Godlee F. CT scans give high doses of radiation. *BMJ* 1992;304:337. (8 February.)

2 Shrimpton PC, Hart D, Hillier MC, Wall BF, Faulkner K. *Survey of CT practice in the UK. Part I. Aspects of examination frequency and quality assurance*. Oxford: National Radiological Protection Board, 1991. (R248.)

3 Shrimpton PC, Jones DG, Hillier MC, Wall BF, Le Heron JC, Faulkner K. *Survey of CT practice in the UK. Part II. Dosimetric aspects*. Oxford: National Radiological Protection Board, 1991. (R249.)

4 Jones DG, Shrimpton PC. *Survey of CT practice in the UK. Part III. Normalised organ doses calculated using Monte Carlo techniques*. Oxford: National Radiological Protection Board, 1991. (R250.)

5 Recommendations of the International Commission on Radiological Protection. *Annals of the International Commission on Radiological Protection* 1991;21:1-3.

Income distribution and life expectancy

SIR,—R G Wilkinson seems to have misunderstood our analysis of the relation between social inequality and inequality in health.¹ He states: "These [Wilkinson's] results should caution against using the lack of a close relation between national mortality and gross national product per head to infer that health inequalities within societies cannot be a reflection of income differentials." The reference given for such incautious use is our recent detailed analysis of life expectancies, age specific death rates, and causes of death for 22 European countries from 1954 to 1984, in which we used data from the World Health Organisation.² Like Wilkinson, we used gross national product per head and found many clear departures from any simple relation between health and poverty.

We did not, however, as implied, deny a relation between health inequalities and the distribution of wealth. We identified three policy options. One was the redistribution of wealth. We commented: "There is plenty of evidence in past history to demonstrate the enormous potential effect of an increase in living standards on health. That option is still relevant, particularly with regard to the causes and the health effects of child poverty. In many prosperous countries the lethal consequences of deprivation may have been prevented or reduced by welfare services and by modern technology, but physical and intellectual development may have

been hindered and health harmed." We cannot regard such words (or other comments throughout the paper) as a denial of the effects of income differentials on health inequalities.

We differed from Wilkinson in our emphasis on the large decrease in deaths from diseases known to be caused or aggravated by poverty (for example, deaths from infectious and respiratory diseases) and the large increase in deaths from such diseases as lung cancer and ischaemic heart disease due to smoking, sedentary living, and dietary intakes far removed from deprivation. Our analysis made clear that overconcentration on poverty ignored the great diversity of disease and its many social causes and the lethal nature of modern consumption behaviours with their varying relation to relative wealth and deprivation. A recent example of such overconcentration is Tony Delamothe's article on social inequalities in health, focused almost exclusively on relative poverty and the redistribution of income.³ Income distribution figured in our interpretation as one among many causes.

Our case was carefully reasoned and based on the analysis of a continent's mortality over 30 years. It would be sad if our conclusions, which implied a diverse and dynamic relation between social inequality and inequality in health, should simply be seen, because of an unfortunate reference, as a denial of the links between relative deprivation and health status.

DEBORAH BAKER
RAYMOND ILLSLEY

University of Bath,
Bath BA2 7AY

1 Wilkinson RG. Income distribution and life expectancy. *BMJ* 1992;304:165-8. (18 January.)

2 Baker D, Illsley R. Trends in inequality in health in Europe. *International Journal of Health Services* 1990;1:2:89-111.

3 Delamothe T. Social inequalities in health. *BMJ* 1991;303:1046-50. (26 October.)

SIR,—R G Wilkinson proposes the interesting hypothesis that relative income distribution is causally related to health, particularly in countries in which the gross national product per head is above \$5000.¹ The author's analysis covered Western, developed countries, but other developed countries—those of the former eastern European bloc—provide an additional context in which to explore the hypothesis.²

During 1975-85 small reductions in life expectancy at birth were recorded in Poland and Hungary but small increases were recorded in wealthier Czechoslovakia and the then German Democratic Republic. The increases in the last two countries were smaller than those achieved by Western nations, including the United Kingdom, in the same period. Given the political system and state monopoly that operated in countries in the Eastern bloc, the variation in income for different types of employment was small during the period in question. On the basis of the theory underlying the hypothesis, therefore, we should expect there to have been greater increases in life expectancy in those relatively wealthy countries with a more egalitarian distribution of income—namely, Czechoslovakia and the German Democratic Republic—than in the relatively non-egalitarian United Kingdom. In addition, Józán found that life expectancy of males varied among the 22 districts of Budapest from 64.2 years to 69.7 years.³ This was in a society in which we would expect the range of income distribution to be small and to vary little among the districts. In fact, as late as 1989, bus drivers in Budapest had an income at least as high as that of doctors.

Preliminary evidence from eastern Europe, with ostensibly egalitarian income policies, does not, therefore, support Wilkinson's hypothesis. Nevertheless, several caveats should be taken into account. The wealth of eastern European nations is hard to evaluate because of the former non-convertible status of their currencies, the dif-

facilities of taking into account the comparative purchasing power of currencies outside the Organisation for Economic Cooperation and Development,⁴ and the countries' large "black economy." But people in most types of occupation, both manual and non-manual, seem to work in the black economy. Relative deprivation was seen not necessarily in relation to direct income distribution but in relation to privileges such as the ability to travel abroad or access to Western goods, privileges that in the West are related to income.

Eastern Europe will be a testing ground for Wilkinson's hypothesis in view of the introduction of market forces, which will widen income differentials appreciably.

D P FORSTER

Division of Epidemiology and Public Health,
School of Health Care Sciences,
University of Newcastle upon Tyne Medical School,
Newcastle upon Tyne NE2 4HH

- 1 Wilkinson RG. Income distribution and life expectancy. *BMJ* 1992;304:165-8. (18 January.)
- 2 Boys RJ, Forster DP, Józán P. Mortality from causes amenable and non-amenable to medical care: the experience of eastern Europe. *BMJ* 1991;303:879-83.
- 3 Józán P. *Studies in mortality differentials: an ecological study of mortality differentials in Budapest. Part 1.* Budapest: Central Statistical Office, 1987.
- 4 Parkin D. Comparing health service efficiency across countries. *Oxford Review of Economic Policy* 1989;5:75-88.

Bone banks

SIR,—H I Atrah's proposal that bone banks should be developed by the national blood transfusion services¹ will be warmly welcomed by those who have recently expressed concern at the lack of tissue banking facilities in the United Kingdom compared with Europe and North America.²

About 18 months ago the directors of the Scottish National Blood Transfusion Service concluded that it would be in patients' best interests if tissue banking, starting with bone banking, was developed on a national (Scottish) basis within the transfusion service's centres. This programme has now been fully commissioned, and bone banking is a feature throughout Scotland. There is little doubt that the regional blood transfusion centres' skills with regard to good manufacturing practice for biological agents for therapeutic use have played a major part in securing a rapid and successful outcome to the first phase of this coordinated development of tissue banking nationally. Success would not have been possible without the enthusiastic collaboration of local orthopaedic surgical teams.

Further plans are now emerging for an integrated programme of multitissue banks in the regional transfusion centres in Scotland. The support of the British Blood Transfusion Society, which might encourage the creation of a special interest group directed towards tissue banking, would also be an important contribution to this development.

J D CASH

Scottish National Blood Transfusion Service,
Edinburgh EH17 7QT

- 1 Atrah HI. Bone banks. *BMJ* 1992;304:68. (11 January.)
- 2 Phillips GO. Tissue banking in Europe. *Lancet* 1991;338:1514-5.

Organ donation from intensive care units

SIR,—Sheila M Gore and colleagues' audit of organ donation from intensive care units shows that much can be done to increase the number of organ donors from such units.¹ The authors, quite rightly, state that age is no limit to corneal donation. We wish to emphasise that corneas can be donated up to 24 hours after death and can be

easily retrieved by the local ophthalmologist from donors in the mortuary or other place of rest. This is not the case with the other organs mentioned in the audit and means that there is a much larger number of potential corneal donors outside intensive care units. In Greater Manchester last year 122 corneas were donated, of which only 22 came from intensive care units or through transplant coordinators.

The only principal exclusions for corneal donation are transmissible infections such as HIV and hepatitis B virus infections. Previous corneal disease and ocular surgery may make the cornea unsuitable for transplantation, but such eyes are still extremely valuable for research into ocular disease. If these facts were known by all medical practitioners and staff dealing with dying patients and the recently bereaved the number of corneal donations could increase considerably. Often the potential for corneal donation is overlooked when other organs are unsuitable for donation because of the patient's age or coexisting disease or malignancy. Nationally coordinated eye banks and associated scientific staff can assess donated corneas for freedom from infection and tissue quality. The fact that corneal donation can go towards salvaging the sight of many potentially blind patients is often a great comfort to the relatives of the person who has died.

J KWARTZ
A E A RIDGWAY
A B TULLO

David Lucas Eye Bank,
Manchester Royal Eye Hospital,
Manchester M13 9WH

- 1 Gore SM, Cable DJ, Holland AJ. Organ donation from intensive care units in England and Wales: two year confidential audit of deaths in intensive care. *BMJ* 1992;304:349-55. (8 February.)

SIR,—The confidential audit of intensive care deaths in England and Wales initiated by the Department of Health has further clarified the means by which organ donation can be increased.¹ As only 6% of families of potential donors were not asked about organ donation, required request legislation would have little impact. Sheila M Gore and colleagues suggest that an increase of up to 7.7% (100/1300) in organ donation could be achieved by reducing delays in the performance of tests for brain stem death. Other recent studies have shown a larger potential increase from increasing the number of patients being ventilated, but this would have important implications for resources.^{2,3}

The Department of Health's audit shows how opt out legislation would result in a considerable increase in organ donation. Allowing for a 2% opt out rate (as in Belgium), an increase in organ donors of 32.8% (630) would have been produced.

We must hope the Department of Health appreciates the importance of its own audit and strives to reduce the waiting list for organ transplants with the same enthusiasm as waiting lists for minor surgical procedures.

B RHODES

Alder Hey Children's Hospital,
Liverpool L12 2AP

- 1 Gore SM, Cable DJ, Holland AJ. Organ donation from intensive care units in England and Wales. *BMJ* 1992;304:349-55.
- 2 Feest TG, Riad NH, Collins CH, Golby MGS, Nicholls AJ, Hamad SN. Protocol for increasing organ donation after cerebrovascular death in a district general hospital. *Lancet* 1990;335:1133-5.
- 3 Salih MAM, Harvey I, Frankel S, Coupe DJ, Webb M, Cripps HA. Potential availability of cadaver organs for transplantation. *BMJ* 1991;302:1053-5.

SIR,—Sheila M Gore and colleagues' paper reporting their audit of deaths and organ donations in intensive care units¹ should, at last, lay to rest previous allegations that large numbers of potential donors in intensive care units were being missed.²

The part of their conclusion relating to a reduction in relatives' refusal is correct but that suggesting prompter testing of brain stem death is questionable. Delays relate to the initiation of tests and the interval between them. In my experience in several British hospitals the first and second sets of tests are generally carried out within one to three hours of each other.

The practicalities of initiating tests are related to several factors, which may not be apparent to those who do not perform them. There is no way of ensuring that effects of sedative, analgesic, and anaesthetic drugs have passed other than by waiting for an adequate period.³ This period is open to clinical opinion, and staff must therefore err on the side of caution. The difficulties in predicting outcome after brain injury, particularly in younger patients, lead to wide variation in the duration of active management.

Tests should be seen to be done after careful consideration of the patient during the daytime, which effectively rules out at least 12 hours of any day. Equally importantly, discussions with relatives, who increasingly are delayed by travelling long distances, are best carried out in daylight hours. Confidence in tests is improved, among less informed observers, if they are seen to confirm brain stem death in most cases. In many cases the patient's hopeless prognosis is evident from the outset and any treatment is probably as much for the benefit of relatives and other attending staff as for the patient. In such cases a delay allows them time to appreciate the situation fully, and in this period the relatives' response to requests for organ donation may change from being initially negative to positive.

Careful handling of relatives, who in a distressed state may become aggressive and confused, is essential if bad publicity related to occasional cases is to be avoided. A perception that tests are performed too promptly may repeat the fiasco of 1980, when adverse publicity on *Panorama* produced a pronounced decline in organ donation.^{4,5}

A BODENHAM

Department of Anaesthesia,
General Infirmary,
Leeds LS1 3EX

- 1 Gore SM, Cable DJ, Holland AJ. Organ donation from intensive care units in England and Wales: two year confidential audit of deaths in intensive care. *BMJ* 1992;304:349-55. (8 February.)
- 2 Chisholm GD. Time to stop the softly softly approach on organs for transplantation. *BMJ* 1988;296:1419-20.
- 3 Bodenham A, Park GR. Care of the multiple organ donor. *Intensive Care Med* 1989;15:340-8.
- 4 Bradley BA, Brooman PM. *Panorama's* lost transplants. *Lancet* 1980;ii:1258-9.
- 5 Pallis C. Medicine and the media. *BMJ* 1980;281:1064.

Rationing

SIR,—Unfortunately, as it reads like "three cheers for rationing," Richard Smith's editorial could be misunderstood by managers and the lay public.¹ It misleads them further by conflating three different kinds of rationing—that entailed in clinical decisions to withhold treatment in certain cases; that entailed in planning priorities in the NHS; and that now advocated in disqualifying, not on clinical but on economic grounds, whole groups of people from the treatment they need and, in plain words, consigning them to death or unrelieved invalidism.

Perhaps bemused by "democracy in all its messy splendour," Smith idealises the capacity of nurses, managers, and the public to make judgments with regard to all three types of rationing. Unfashionable as it is to say that doctors know best, they still do often know better than anyone else, including philosophers and economists, about these matters.

It is a cliché, since Foucault, to say that all "disciplines" are influenced by ideology. When economists—for example, Cam Donaldson and Gavin Mooney, writing on needs assessment and