

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

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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.

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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.

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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.

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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-