stantiated by the Canadian study." The Canadian findings were qualitatively similar to those from the European trial, their combined results suggesting an excess fetal loss rate of 3.2% (95% confidence interval 0.3% to 6.2%) in those investigated by chorionic villus sampling compared with amniocentesis.¹ It is for individual women and those responsible for their care to decide whether this risk is acceptable in order to achieve earlier diagnosis (or exclusion) of fetal abnormalities and the advantages of earlier termination if this is then indicated.

Some disappointment that chorionic villus sampling may not be quite as safe as amniocentesis is understandable, but if this is the case—and the evidence suggests that it is—those concerned need to know and attempts to try to explain the excess away are not in their interests.

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1 MRC Working Party of the Evaluation of Chorionic Villus Sampling. MRC European trial of chorionic villus sampling. *Lancet* 1991;337:1491-9.

2 Liu DTY. Chorionic villus sampling. *BMJ* 1991;303:1402. (30 November.)

3 Canadian Collaborative CVS-Amniocentesis Clinical Trial Group. Multicentre randomised clinical trial of chorionic villus sampling and amniocentesis. *Lancet* 1989;i:1-6.

Could an outbreak of poliomyelitis occur in the UK?

SIR,—S O Cameron and colleagues ask whether an outbreak of poliomyelitis could occur in the United Kingdom.¹ A patient with fatal acute poliomyelitis was treated recently in this hospital, but despite extensive microbiological investigation the causative organism is not known.²

Acute poliomyelitis was diagnosed only after postmortem examination and investigations performed during life had been inconclusive: the spinal cord was removed and examined four weeks later, after fixation in formalin. The spinal cord is not routinely examined at postmortem examination and, indeed, is probably examined very rarely in postmortem examinations performed for a coroner. It is therefore feasible that this case, although not proved to be due to poliovirus, could be one of several and that other fatal cases of poliomyelitis have escaped diagnosis.

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1 Cameron SO, Carrington D, Patterson W. Could an outbreak of poliomyelitis occur in the UK? *BMJ* 1992;304:52. (4 January.)

2 A case of poliomyelitis. *Communicable Disease Report* 1991;1:209.

Resuscitation and hypothermia

SIR,—Minerva¹ mentions a study in which none of 185 patients who had suffered a cardiac arrest outside hospital were discharged; all had received unsuccessful resuscitation outside hospital, which had been continued in the hospital emergency room.² What Minerva fails to mention is that hypothermic patients were excluded from this study; this is a vital point, as we recently found.

A patient was brought to Westminster Hospital, having been found unresponsive while in police custody. A police surgeon had diagnosed a cardiac arrest, and an ambulance crew with paramedical training had started resuscitation. The time from

the cardiac arrest to the start of resuscitation was over five minutes. On arrival at the hospital the patient had no pulse, was not breathing spontaneously, felt cold, and had fixed dilated pupils. Further resuscitation was continued in line with guidelines of the Resuscitation Council. The patient's core temperature was 29°C on a low reading thermometer.

As hypothermia is a contraindication to stopping resuscitation we decided to rewarm the patient by using extracorporeal bypass. For technical reasons this had to be instigated at a neighbouring hospital, and cardiopulmonary resuscitation was continued in the ambulance and into the operating theatre, where bypass was established via the femoral route. Within 10 minutes the patient developed a cardiac output. Cardiopulmonary resuscitation had been performed for over 60 minutes. The patient subsequently recovered completely.

Defibrillation is not likely to be effective if a patient's core temperature is less than 30°C, and resuscitation should not be abandoned until determined efforts to rewarm the patient have been made. Pupillary reactions may be misleading during resuscitation, especially after drugs have been given. The saying that you are not dead until you are "warm and dead" should be borne in mind by the person responsible for stopping resuscitation, especially at this time of year.

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1 Minerva. *BMJ* 1991;303:1410. (30 November.)

2 Gray WA, Capone RJ, Most AS. Unsuccessful emergency medical resuscitation—are continued efforts in the emergency department justified? *N Engl J Med* 1991;325:1393-8.

Cost effectiveness of rehabilitation

SIR,—Daphne Gloag reported a conference on rehabilitation organised by the British Society of Rehabilitation Medicine.¹ Several papers have recently been published in American journals, dealing with the effectiveness of rehabilitation for head injury when it is delivered as a coordinated system—that is to say, as the patient's needs change the patient's management changes and he or she moves from an acute high dependency unit to more conventional inpatient neurorehabilitation, to a community based transitional unit, to job coaching, to return to employment or sheltered or supported living or whatever is appropriate.

Given this organisation of services, two groups of workers have clearly shown that the system is effective in terms of increasing the patient's productivity of life.^{2,6} Productivity is carefully defined, and the costs and benefits of different gains in productivity are defined. These workers show that an investment in appropriate rehabilitation can save many millions of dollars by reducing a patient's dependency, reducing the need for support, care, and attendance and (in the British context) the need for social security benefits.

In conclusion, there is now clear evidence of the effectiveness and cost effectiveness of skilled and appropriately delivered neurorehabilitation. I emphasise that the rehabilitation has to be skilled and appropriate.

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Chaos theory

SIR,—W J Firth's article on chaos theory was a good general introduction to the subject for clinicians.¹ There are, however, many other aspects of medicine in which chaos is relevant. For example, Rapp *et al* have developed a method of electroencephalographic monitoring that may predict impending epileptic fits as well as monitor the effects of drugs on the central nervous system.² The variations of dopamine concentrations in patients with Parkinson's disease have been shown to be chaotic and therefore amenable to mathematical manipulation.³ The mathematics of chaos theory has described the seasonal variations of measles epidemics; this calls for further research into the behaviour of other epidemics.

Some rhythmic processes in the body (insulin release and circadian and reproductive cycles) have already been re-evaluated by using the theory of chaos. In fact, almost any cyclic process is amenable to detailed mathematical analysis, which can help explain the underlying mechanisms and suggest ways for therapeutic intervention. This has been shown in the case of aging mechanisms. By using advanced mathematical formulas derived from the theory of chaos I have offered theoretical ways of altering some of the steps in protein modification that occurs with normal aging.⁴

Obviously, more research is needed into this fascinating new theory. The relevance of chaos in medicine needs to be more widely studied.

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Caring for larger lists

SIR,—G N Marsh writes about the possibility of increasing list sizes for general practitioners in the United Kingdom.¹ He should be aware, however, that experience in the United States shows that the general list size of between 2500 and 4000 patients cared for by community family physicians results, in the best of settings, in much preventive and long term care remaining undone. Even in the computer age, with efficiency of computerised practices (the rare situation), the number of elderly people and children who receive appropriate immunisations and the number of well managed diabetic and hypertensive patients falls far short of what have been set as goals for such care in general practice.

In the United States, particularly in times of economic hardship, patients visit physicians far less often than do patients in the United Kingdom; this results in fewer opportunities for practitioners to intervene prospectively in their care. Even in health maintenance organisations, where in theory there are no financial obstacles to obtaining

care, the number of patients who are assigned to generalists is far lower than the number Marsh proposes. Thus Marsh's statement that what should be done can be done in half the number of visits is not supported by the American experience. We have half the number of visits, twice the cost for the same level of care, and far less effective prevention than in the United Kingdom.

General practice in Britain is, with all of its faults, a model of efficient, personalised, accessible care compared with what is available in other industrialised countries. Unless there is a large pot of money in the British economy to pay for the increased numbers of nurses, educators, and other staff who are required to care for 4000 patients making half the current annual number of visits to their general practitioner, I suggest sticking with the present ratio of patients to general practitioners or risk the loss of a major asset of the NHS—the good will of patients toward their general practitioners.²

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1 Marsh GN. Caring for larger lists. *BMJ* 1991;303:1312-6. (23 November.)

2 Frey JJ. Making a visit: an American GP practising in the NHS. *BMJ* 1982;285:614-6.

Training in obstetrics

SIR,—I was pleased to see several articles in a recent issue devoted to the inadequacies of post-graduate training in obstetrics and gynaecology.^{1,3} It is a severe indictment of the specialty that a third of those who become members of the Royal College of Obstetricians and Gynaecologists then leave, having completed the worst phase of training, when work for examinations is combined with long hours of clinical duty.¹ I attended the meeting held to investigate problems with the present career structure that Susan M Blunt reports.¹ It was clear that one of the major hurdles facing trainees has not been recognised: it is presently almost impossible to train fully within the NHS to become a consultant.

Progression to senior registrar level is blocked if you do not leave the NHS to spend time in research. Blunt made only a passing reference to this, and a paper presented at the college meeting suggested erroneously that second degrees were unnecessary as few senior registrars had them. The wrong question had been asked. Almost all successful applicants for recent senior registrar posts have spent time in research posts whether or not they have completed their MD.

Registrars who have obtained their membership face difficulty and uncertainty in competing for charitable funds to support them in research unless they work in infertility or menopause clinics in the private sector. Most trainees suffer a large cut in salary during this period, which places a heavy financial burden on those with families to support. When they compare themselves with their contemporaries at university, comfortably established in general practice, many leave the specialty.

The college and the NHS management must decide whether they require all consultants in obstetrics to have research experience. If this is genuinely considered to be important, as I believe it is, it should be an integral part of our training properly funded by the NHS, which ultimately benefits. This would allow proper planning of projects, which would enhance both the quality of research undertaken and the benefits to the trainee. Research should not be just another means of weeding out the least tenacious trainees.

Those who are disheartened enough to leave the specialty deter many more from joining. The current system tends to select for trainees with

aggressive ambition and hence loses many with more caring qualities, an emphasis that the women in our care would doubtless reverse. In addressing these problems the college must clarify its attitude to research and ensure that training can be completed within the NHS.

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1 Blunt S. Training in obstetrics. *BMJ* 1991;303:1416. (7 December.)

2 Ennis M. Training and supervision of obstetric senior house officers. *BMJ* 1991;303:1442-3. (7 December.)

3 Smith LFP. GP trainees' views on hospital obstetric vocational training. *BMJ* 1991;303:1447-52. (7 December.)

SIR,—The question asked of trainees at a recent meeting at the Royal College of Obstetricians and Gynaecologists¹—"What's wrong with the specialty of obstetrics and gynaecology?"—has a relatively simple answer. There is nothing wrong with the specialty but a good deal wrong with its perception.

Input and dropout rates of trainees have been well documented in the college's manpower reports and the downward trend recognised. Many of the dissatisfactions highlighted by juniors confirmed earlier suspicions, and these have served to accelerate steps to improve the structure of training in the United Kingdom. But major changes take time. The college is already committed to organising structured training programmes, re-evaluating the training for and assessment of the MRCOG examination, and accepts that part time training and job sharing should improve the quality of life (a major issue, according to trainees).

The success of these policies depends much on the enthusiasm and commitment of trainers. Present consultants brought up on long, unrealistic hours of duty and years of residency may justifiably ask how their future colleagues will gain necessary experience from reduced exposure to acute problems and shortened hours of work. Surely the answer lies in a more methodical approach akin to that in the United States, where a licence for independent practice is usually achieved by the age of 33 after formal structured training but the specialist is then monitored by mandatory continuing medical education and even recertification—ideas already being seriously considered by the college.

Far from being inactive, the college is alive with fresh and innovative ideas aimed at raising and maintaining the profile of obstetrics and gynaecology, and the successful listening exercise, initiated by the president, showed an encouraging positive attitude. Finally, Susan M Blunt's call for increasing the numbers of consultants¹ is central to the success or otherwise of recruitment and retention in the specialty, and all concerned with training must seize every opportunity to persuade those with influence to accept this premise.

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1 Blunt SM. Training in obstetrics. *BMJ* 1991;303:1416. (7 December.)

Junior doctors' working practices

SIR,—I presume that the main reason for the proposed changes in junior doctors' working practices is to benefit those same junior doctors.¹ Yet when I talk to my colleagues the general impression I get is that shift systems will probably worsen our quality of life. Instead, why could not

the government have offered the following, which is what every junior doctor wants?

(1) Non-medical staff trained to carry out phlebotomy, intravenous drug administration, electrocardiography, portering, and routine clerical work and to find empty beds.

(2) Overtime pay equal to daytime rates.

(3) A half day off work after a busy night on call.

The government's failure to implement these demands boldly and swiftly indicates a brutality reminiscent of working practices in the nineteenth century.

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1 Beecham L. Juniors may still reject pay deal. *BMJ* 1992;304:10. (4 January.)

SIR,—As a junior hospital doctor, I believe that once again we are about to be let down by the BMA, on the issue of hours of work.^{1,2} What hospital management is going to agree to pay doctors 100% of basic pay for out of hours work in a full shift system when it can get away with paying 50% for an on call rota, with the additional cost advantages of employing fewer doctors and consequently fewer administrative costs and claims for such items as removal expenses?

Of course junior doctors would prefer to work fewer hours for the same pay, but in a system where—especially if the expected influx of doctors from the rest of Europe occurs—there are more doctors than jobs few will refuse to take a job because of the hours required and risk a period of unemployment with a gap in their curriculum vitae to explain.

The suggestion that prospective cover should be included in any agreement to reduce hours shows a complete lack of understanding of the situation. When all doctors take their full allowance of annual and study leave a 1 in 3 rota with prospective cover is a 1 in 2 rota for half of the time; a 1 in 4 rota with prospective cover is a 1 in 3 rota 70% of the time; a 1 in 5 rota with prospective cover is a 1 in 4 rota 86% of the time; and a 1 in 6 rota with prospective cover is actually a 1 in 5 rota for all but two weeks of the year, when it is a 1 in 4 rota. This assumes that doctors are covering the leave only of doctors on the same rota as themselves, that lieu days are not taken on on call days, and that no one goes off sick.

Until excessive hours are prohibited by the high cost to employers or legislation they will remain.

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1 Beecham L. Juniors may still reject pay deal. *BMJ* 1992;304:10. (4 January.)

2 Beecham L. BMA recommended "affordable" out of hours pay. *BMJ* 1992;304:57. (4 January.)

Corrections

Dogs that bite

A printer's error occurred in this letter by Simon N Voss and Hugh F Thomas (11 January, p 116). The final sentence of the second paragraph should have read: "A crude extrapolation . . . suggests that about four people per million of the population of West Midlands are referred to plastic surgeons with dog bites each year."

Heart valve records falsified

An editorial error occurred in this letter by Matthew Shiu (11 January, p 118). The fourth sentence should have read: "As the risk of valve replacement is currently much higher than that of strut fracture, explanation is not recommended."