welfare of individual patients. It is still early days in these developments and inevitably there must be stresses and straining until the right balance is found.

The serious and frightening moral dilemma confronting doctors which they have so far failed to face is—at what point does it become professionally irresponsible to carry on maintaining clinical responsibility when supporting resources generally are steadily and surreptitiously declining?

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Monetary value of a human life

SIR,—Dr W I Card and Mr G H Mooney in their interesting paper (24-31 December, p 1627) show the difficulty of making decisions in the NHS and illustrate how rational solutions may be reached by use of a decision theory model. This type of analysis is probably familiar to the policy makers at the Department of Health and Social Security, but many, who work in hospitals, may find the theory strange and difficult to handle. With the help of games theory, however, it should be possible to construct a simple model displaying the economic forces which must eventually shape policy. What follows is a broad outline of the "Hospital Management Game." Obviously advanced players would require a far more complex model but it would have the same economic core.

The fundamental rule is that the hospital manager must keep solvent to stay in the game; if he is to win he must show sufficient profit to enable him to take over other hospitals. He makes a profit when he provides a utility with a monetary value in excess of its cost—namely, $pu > C$. For the sake of simplicity only two outcomes are considered, survival and death. The manager must try to increase the probability of survival and this can only be achieved by the systematic monitoring of all admissions. To rely on the excellence of the clinical team would be most unwise, as the highly proficient are prone to undertake the treatment of high risk cases. Clinical performance must be audited, and control placed firmly in the hands of those who show a consistent profit.

The measurement of u , the utility of survival, is, as Dr Card and Mr Mooney have pointed out, difficult and contentious, but it is surely reasonable to relate it to the productive capacity. Unfortunately it is often impossible to estimate the productive capacity of a patient—one acute coronary thrombosis may look very like another—but this problem could be solved by the use of a centralised computer linking the DHSS and the Inland Revenue. The record could be adjusted annually and an accurate figure for each patient relayed to the intensive care unit within a very short time. The importance of this service can scarcely be overestimated, as without it physicians and surgeons could easily commit the catastrophic economic error of treating the wrong patient. Now comes the disagreeable element in the system—cost. Even the finest centre of excellence must in the end prove to be but a splendid façade if its costs exceed its profits. At all times stringent economy should be the rule. Unproductive beds must be weeded out and redundant staff dismissed. However, it is important that a misguided emphasis on humane values should not lead to disproportionate economies in the maintenance of the hospital fabric. Well-maintained institutions have a high utility value. Furthermore, neglect of the fabric may lead insidiously to absurd capital costs far in excess of any value which might be assigned to the patient-orientated functions of the hospital.

The model makes it clear that geriatric inpatient treatment is a hopelessly bad buy: an appeal to

general implicit values may provide some additional money but never enough to cover the cost. The winning strategy must lie in emphasising community care and gradually reducing beds and staff. This should be done with circumspection and with proper regard for public relations. Poor presentation of hospital policy can cause much misunderstanding and may even give rise to irrational assertions of individual values, thus causing much local difficulty and costly delays. Even in the most rationally planned organisations abuses tend to creep in and managers must be vigilant and ensure that black markets do not develop within their hospitals. Old people are often selfish and, if not watched, may succumb to the temptation to buy treatment over and above what is allocated to them by the regulations. Also the young sometimes attach sentimental value to their aged parents and may attempt to purchase life-saving remedies, despite the fact that these are inappropriate, uneconomic, and contrary to public policy. Possibly these evils could be averted by a contributory scheme for the purchase of negative years, payments being made during the worker's productive life. As well as reducing the beneficiary's official age, the negative years would serve as a useful low-cost incentive for the nation's working force.

Some may feel that this model is too idealistic, but, provided they grasp the essential fact that a man's life is worth a finite amount of money, they will undoubtedly find their own way to a rational solution of the problems of the NHS. We should all take encouragement from the scientific advances which have now made it possible to develop an extremely valuable military weapon—the neutron bomb—which does no damage to property, thus at last making an economically successful war a real possibility. Surely, this should spur us all on to make an equal success of our Health Service.

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SIR,—The proposals of Dr W I Card and Mr G H Mooney (24-31 December, p 1627) to seek a consistent financial valuation for human life for the purpose of resource allocation for forms of health care are inappropriate. The use of such valuations in decision-making would lead to unsound and inhumane decisions.

Their argument is based on the fallacy that the objective of medical treatment is to "save life" (that is, "prevent death"). We are not, nor do we seek to be, immortal. We may postpone but cannot ultimately prevent death; we should not pretend to ourselves or to others that we can. In making decisions most clinicians intuitively take account of the likely duration and quality of life in the extra years that are likely to result in a way no "formula" will achieve.

The proper objectives of medicine are humanitarian. We must seek to prolong life only where expectations as to quality warrant this. It is not costly to "cure" pneumonia with antibiotics. But to do so in an octogenarian who has prostatic secondaries in his spine would be inhumane. In such circumstances life might be deemed to have a "negative value" both to the individual and to society. In other circumstances there may be wide divergence between the values of life of an individual to himself and to society—the psychopath who enjoys his life but is an expensive hazard to others, and the genius with painful and chronic disease and craving for euthanasia but who is an asset to the community, are both extreme

examples. Not only have we separate scales for value to "self" and to "society," but both of these range from highly "positive" values to low "negative" ones. The use of any form of "mean" in these circumstances is a non-sense.

The absurdity of using a measure unrelated to the real objective is most beautifully illustrated by the last of the illustrative examples tabulated by Drs Card and Mooney. The purpose of building blocks of flats is not to "save life" but to provide homes in which families may live in reasonable comfort and security. Building regulation changes to ensure that flats do not collapse would still have been necessary to give sufficient peace of mind and confidence to enable high-rise flats to be let even if nobody had died at Ronan Point—and if there had been no death in that disaster the "implied value of life" would doubtless have been infinity, not a mere £20m. In fact, of course, a value is "implied" only when the expenditure was incurred with the express intention of securing the object to be valued. If expenditure is incurred for a different reason it is irrelevant to the valuation of any object secured as a byproduct.

One of the great dangers of our time is the development of pseudoscientific management theories which take account of only those factors which can be measured and expressed in numbers and ignore other and equally important aspects of the situation. We must not allow such theories to be applied in situations where they can do as much damage to the Health Service as they have in industry. There, because accountants were able to compute so-called economies of scale but did not know how to measure the diseconomies caused by the consequent deterioration of labour relations, governments pursued policies of promoting "mergers," large company growth, and nationalisation. These have had a detrimental effect on our economy. While it is possible in several ways to assess in financial terms the value for some particular purpose of a human life, we have no means of valuing suffering or pain. Statistics are valuable only if used wisely. We need to learn when *not* to use them and how to use them better.

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Adjuvant liver perfusion in colorectal cancer

SIR,—It is encouraging to see in the paper by Mr I Taylor and others (19 November, p 1320) new ideas being tested for the treatment of patients with colorectal cancer when one remembers that only one in four patients are alive five years after hospital treatment. However, the design and conduct of randomised trials in large-bowel cancer is a difficult subject. Even when relatively small numbers of patients are being compared, whether formally or informally, it is helpful to report as much as possible about the matching of the groups. It would have been interesting to know more detail about the staging of the tumours—for example, the harvest of lymph nodes and the number of nodes involved, especially in the patients who developed liver secondaries.

The authors seem to have assumed that heparin has no intrinsic action to prevent the development of secondary tumours. However, there is evidence¹ to suggest that anticoagulants

do influence secondary tumour formation and perhaps liver perfusion with heparin alone should have been used in the control group. The design of this trial will not allow us to distinguish between the actions of heparin and those of fluorouracil.

Nevertheless, in spite of these criticisms, if the trends of the trial are confirmed it could form a basis to improve the outcome in patients with this common tumour.

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¹ White, H, and Griffiths, J D, *Proceedings of the Royal Society of Medicine*, 1976, **69**, 476.

* *We sent a copy of this letter to Mr Taylor, whose reply is printed below.—ED, *BMJ*.

SIR,—I am grateful to you for allowing me to answer the points raised by Mr Fielding. Firstly, there were equal numbers of lymph nodes involved with tumour in the two groups in the first 50 patients studied, as shown in the paper. We have recently reviewed our results in 78 patients followed up for between six and 24 months. Thirteen out of 38 patients in the perfused group had lymph-node involvement (Dukes C) and 16 out of 40 in the control group. Of the 10 patients in the control group who have subsequently died with recurrent disease, 8 had Dukes C and 2 Dukes B tumours. All three patients who have died in the perfused group had Dukes C disease. In those patients who had liver metastases at necropsy (six in the control and one in the perfused group), all but one had lymph nodes involved with tumour at initial surgery.

We were aware of the known effect of heparin in the development of secondary tumours both from the evidence in the paper quoted and from the work of Hilgard *et al.*¹ However, after a good deal of thought and discussion at the commencement of the trial we considered that the inclusion of a control group with perfusion of heparin alone was not justified. It seemed more logical to include a drug in the treatment regimen which is well known to have a cytotoxic effect on large-bowel adenocarcinoma. It may be that the inclusion of heparin acts as a "bonus" not only by discouraging thrombosis but also by discouraging the establishment of liver micro-metastases. However, I agree that this trial will not distinguish between the actions of heparin and those of 5-fluorouracil.

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¹ Hilgard, D, *et al*, *European Journal of Cancer*, 1972, **8**, 347.

Maternal pethidine and neonatal depression

SIR,—The implications of the study by Dr P C Wiener and others (23 July, p 228) on pethidine-induced neonatal depression are diverse. It is of considerable interest that the effects of pethidine on the neonate are profound and prolonged and that the time when pethidine is given before delivery is of less significance than previously supposed, though this has been well demonstrated without the use of naloxone.¹

In busy peripheral hospitals where epidural

services are not provided pethidine is used routinely in labour. All effective maternal analgesics produce fetal depression and this problem constitutes a major part of our neonatal work load. What we require to know about any new drug is whether it is more effective than a placebo and whether it has significant advantages over drugs already in use. Surely it would have made more sense to perform a trial comparing levallorphan, naloxone, and placebo? Even then, results would have to be interpreted with care because normally the babies in this trial would not have received treatment or investigation of any sort.

In the treatment of babies who have terminal apnoea at birth many have been persuaded by this study to change from levallorphan to naloxone, a drug of which we have little experience. There is no evidence that naloxone is superior to levallorphan in this particular clinical situation. It is too early to say what side effects this drug will have, but in high doses convulsions, transient elevation of partial thromboplastin time, cardiac irregularities, and a hypertensive episode have been recorded.² Particular diligence will be required to monitor side effects if the large intramuscular dose (200 µg) becomes standard.

Active resuscitation will remain essential in the treatment of apnoea at birth unless prevention by narcotic reversal in the mother becomes a practical alternative. Differentiating pethidine depression from other perinatal insults is a constant headache. If naloxone abolishes pethidine depression in a short time we could devote attention solely to those babies who require it. However, the administration of naloxone intravenously at one minute failed to improve Apgar scores at 1 and 5 min against controls.³

In their paper the authors point to the use of naloxone for those babies "who have hitherto been regarded as normal." The prospect of normal babies being given this drug routinely at birth when pethidine has been used in labour is horrifying from both toxicological and economic viewpoints.

The ethical aspects of the design of this trial are not discussed by the authors. It involved considerable medical interference, including cannulation of the umbilical vein, and yet we remain uncertain of the best drug to use for narcotic-induced depression. For 10 years we have known that in mice and men naloxone avoids the respiratory depression associated with nalorphine and levallorphan when there is no coexistent opiate depression.⁴⁻⁷ A definitive trial of naloxone in neonates is urgently required.

The over-prescribing of new "wonder drugs" will continue unabated until those who are given the task of assessing efficacy show a more positive attitude to their responsibilities.

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¹ Harvey, D R, Communication at Perinatal Symposium, Glasgow, November 1977.

² Narcan Information Booklet. Surbiton, Surrey, Winthrop Laboratories.

³ Evans, J M, *et al*, *British Medical Journal*, 1976, **2**, 1098.

⁴ Foldes, F F, *et al*, *American Journal of Medical Sciences*, 1963, **245**, 23.

⁵ Foldes, F F, *et al*, *Canadian Anaesthetists' Society Journal*, 1969, **16**, 151.

⁶ Foldes, F F, and Torda, T, *Acta Anaesthesiologica Scandinavica*, 1965, **9**, 121.

⁷ Evans, J M, *et al*, *Anaesthesia*, 1974, **29**, 721.

Beta-blocking drugs in diabetes

SIR,—In reply to Dr J R Lawrence and his colleagues (10 December, p 1541), theirs is a common criticism of comparative drug studies, since all drugs have different pharmacological profiles and strictly equipotent dosages are often difficult to achieve. Our protocol was designed to determine whether dosages of beta-blockers of similar cardiovascular effect differ in their effects on metabolic homeostasis. The dosages used, albeit at single dose levels, are nevertheless clinically relevant. I disagree that propranolol was used in a more effective dosage, as evidenced by a very similar degree of suppression of exercise-induced tachycardia by all three beta-blockers. There was a clear sinus bradycardia during hypoglycaemia in subjects receiving propranolol. This has been observed by other workers,^{1,2} who have also noted alterations in diastolic and systolic blood pressure. This hypertensive response in propranolol-modified hypoglycaemia is thought to be due to unopposed peripheral vasoconstriction. The mechanism for the associated sinus bradycardia is not known.

Coincidentally, in the same issue there was an excellent review of the mechanisms of blood glucose regulation in hypoglycaemia in the paper by Dr L V Campbell and others (p 1527). Their suggestion that glucagon unresponsiveness to hypoglycaemia in diabetes is a form of selective autonomic neuropathy is novel. The hypoglycaemic action of beta-blockers may in part be due to pancreatic sympathetic antagonism, or to ancillary properties such as membrane-stabilising action acting at the α cell. Indeed, the oral hypoglycaemic sulphonylureas have been shown to have membrane-stabilising action.³ However, whatever the mechanisms, the message for the clinician is that in diabetic patients prone to hypoglycaemic attacks one of the more cardio-selective drugs should be chosen to lessen the risk of hypertensive attacks and to allow more rapid recovery from low blood glucose levels.

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¹ Davidson, N McD, *et al*, *Scottish Medical Journal*, 1976, **22**, 69.

² Lloyd-Mostyn, R H, and Oram, S, *Lancet*, 1975, **1**, 1213.

³ Pogatsa, G, Kaldor, A, and Vizi, E S, *Drug Research*, 1973, **23**, 1085.

Beta-blockers and thyroid function

SIR,—Your review (22 October, p 1039) of the physiology and pharmacology of propranolol is timely. Reference to the use of propranolol in surgical patients, however, suggests the view of a physician with less than adequate contact with the surgical scene. Supervision and treatment of the thyrotoxic patient should be the joint responsibility of physician and surgeon, and like the anaesthetist the physician quickly appreciates the value of propranolol as the sole agent in the pre-operative patient. Its mode of action has still to be determined and recent correspondence (19 November, p 1352) shows the wide individual variation in the metabolism of propranolol, though present indications are that the main impact is on T₃. Despite operation at high T₄ levels, I have still to see symptoms suggestive of postoperative crisis which is most readily detectable by a rise of rectal tempera-