CURRENT TOPICS

The Oregon formula: health economists' dream or Stalinist nightmare?

Richard Stevenson

The television programme *Dispatches: The Oregon Formula* (Channel 4, November 24, 1990) described a remarkable attempt to establish health care priorities in the state of Oregon. In a masterly presentation, it was explained how the Oregon formula relates the cost of a medical intervention to its benefits, measured in quality adjusted life years (QALYs) gained. Treatments are then ranked according to the cost of producing one QALY. At the top of the list is the cheapest, next is the second cheapest and so on. The intention is that the Oregon Health Services Commission will allocate its budget by first purchasing the cheapest QALYs, then the second cheapest and will move down the list until the budget is exhausted. Procedures ranked below the cut off point will not be offered.

The Oregon Health Services Commission is not exactly comparable with the British National Health Service (NHS) since most middle class Oregonians are covered, to a greater or lesser extent, by health insurance schemes. The Oregon experiment will apply only to treatment for those low income families which qualify for public assistance. Private insurance is much less common in the UK, but the significance of the experiment for the NHS is only too apparent. Scarce resources are allocated in the NHS by a mixture of formal and informal devices. The Resource Allocation Working Party (RAWP) formula, queues, and clinical discretion all play a part in determining whether a patient is treated. Decisions to treat, or not to treat, are frequently implicit rather than explicit, and are not always defensible either on grounds of equity or efficiency.

Under the new arrangements for the NHS, purchasers of health care will make contracts with providers of care, and in that process priorities will become explicit. Hard choices have to be made, and the Oregon approach is the only comprehensive system for making these decisions. This paper indicates areas of concern in applying the Oregon formula, or some variant of it, to the NHS and speculates on how the paediatric specialties might fare in a system of this sort.

The QALY concept

The QALY concept has become familiar to clinicians through the work of Alan Williams and his colleagues at York University.¹ It is a brave

attempt to strike directly at the hardest problem in health economics, which is to measure medical output.

Some few medical interventions can be justifiable solely in economic terms. Malaria eradication programmes can 'pay for themselves' in enhanced agricultural productivity; and improved therapies for low back pain could be similarly profitable in averting working days lost due to ill health. Rehabilitation for employment is a valid part of some health care evaluations, but economists have never been comfortable with valuations of health care benefits based solely on the potential earnings of healthy people. This method is difficult to apply in the presence of widespread unemployment, cannot be used to justify the treatment of the elderly or the severely disabled, and gives the impression that economists believe man to have been created for the Confederation of British Industries.

Many health care evaluations avoid measuring the benefits of health care by using cost effectiveness analysis, which seeks to find the method of least cost for achieving a well defined objective. Cost effectiveness analysis is widely used but is not appropriate in all circumstances. Alternative therapies may differ significantly in the process by which outcomes are achieved, and it is often difficult to be certain that the outcomes are identical.

Cost utility analysis has much in common with cost effectiveness but focuses directly on the welfare of the patient by seeking alternative means of producing QALYs. The quality of life is estimated on a 0-1 scale on which 0.00 is dead and 1.00 is well. A large and increasingly sophisticated literature explores alternative methods of measuring the quality of life, but in most areas the work is scarcely beyond the experimental stage.² There is no consensus on how valuations of health should be made and whose opinions should be taken into account. Many studies measure health on disability and distress scales and value these according to the opinions of knowledgeable, or interested, parties such as clinicians, nurses, patients, and parents.^{3 4} An alternative approach, used by the Oregon Health Commission, is to sample public opinion by telephone interviews. This method is fast, cheap, and democratic but requires members of the public to express opinions in areas where they may have no experience.

A final point concerns the way in which QALYs are calculated, and this may be of parti-

Department of
Economics and
Accounting,
Eleanor Rathbone
Building,
Myrtle Street,
PO Box 147,
Liverpool L69 3BX

Correspondence to:
Mr Stevenson.

cular importance in paediatrics. In health care evaluation both costs and benefits are discounted at a conventional rate to enable comparisons to be made between alternative treatments which may differ in the timing of their costs and benefits.⁵ Medical interventions involve initial costs, and sometimes a stream of other expenditure over many years. It is not legitimate to add up costs incurred at different points of time. A pound today is not the same as a pound tomorrow. This has nothing to do with the rate of inflation. If the discount rate is 5%, the present discounted value (PDV) of £100 in a year's time is the amount which, invested at 5%, will yield £100 in a year's time. It is £95.24.

Discounting a stream of costs by applying compound interest in reverse, reduces the whole cost of a treatment to its PDV which can then be compared with the PDV of alternative treatments. In the same way, and for the same reason, benefits are also discounted. Where the benefits of care are expressed in utility terms, discounting reduces the weight attached to life, and the quality of life in the more distant future.

If time horizons are short, as in the care of the elderly mentally ill, the choice of a discount rate may not be critical to the outcome of an economic evaluation. However, PDVs are highly sensitive to discount rates over long time periods such as those which are relevant in paediatric medicine. One year of full quality life in 40 years' time, discounted at 5%, has a PDV of 0.1420. At 10%, the PDV of one year of life in 40 years' time falls to 0.0221. In general, the longer the time period under consideration and the higher the discount rate, the less is the value that will be attached to future benefits.

Merits of QALYs

Cost utility analysis is a powerful and flexible technique which, in principle, can be applied to any medical treatment. Early applications have tended to concentrate on new expensive, life saving technologies. This bias in economic evaluation is explained partly by the sensitivity of the NHS to capital expenditure, and partly by the pressure on clinicians in new fields, such as renal medicine and neonatology, to justify their budgets. Cost utility analysis has the potentiality to correct this bias since it is equally applicable to low technology medicine, and to therapies which may improve the quality of life without necessarily extending life expectancy.

Far more work is needed in the more mundane medical areas but it has already been suggested by Bryan *et al* (S Bryan, D Parkin, C Donaldson. Paper given to Health Economists Study Group, London, 1988) that, for some patients, chiropody may rank high on an Oregon 'type' list. It is also likely that as more treatments are evaluated, many therapies with low unit costs will prove to be extremely expensive in terms of the cost per QALY gained.

In praise of the Oregon experiment, it can be said that no other health system has tackled the problem of scarce resources so directly by flatly and openly denying treatment to some categories of patients. Priorities are explicit and open to debate and revision. The system is also alloca-

tively efficient in that it produces, in the opinion of those consulted, the maximum output of QALYs for a given budget.

In some ways, the Oregon priority system seems harsh but if a similar approach was adopted in the UK, it need not follow that low priority patients would not be treated. The Oregon system limits the liability of a NHS but does not preclude the financing of some treatments by other means. Private insurance and voluntary agencies could cope in some areas, and government might set up special funds in others. There is, for instance, a strong case for the separate funding of experimental medicine which would not rank high on an Oregon type list.

Is paediatrics special?

In most respects, cost utility analysis in paediatric specialties does not seem much different from adult medicine, but certain problems common to all health care evaluation apply with special force in the treatment of the unborn and the newly born. The ranking of treatments according to the cost per QALY gained depends on the cost and the effectiveness of the therapy, the discount rate which is applied, and the opinions of those consulted.

The importance of cost is self evident but it is worth noting that at least one treatment, the provision of intensive care, is generally believed to be cheaper per unit of care for infants than adults. It is also possible that some paediatric treatments would rank high on the Oregon list because some children respond better to surgery and to drug therapy than do some adults. To take one rather specialised example, drug addicted infants are weaned off heroin in a matter of days, presumably because there is no psychological dimension to their addiction.⁶ By contrast, relapse rates from adult detoxification programmes are about 75%.

In one other respect paediatric interventions should fare well in a cost per QALY ranking. By comparison with health care for adults, a successful paediatric intervention generates a large quantity of life. On the other hand, improved treatments have increased the prevalence of many disabling illnesses such as cystic fibrosis, diabetes mellitus, and childhood leukaemia.⁷ A less than fully successful intervention that results in the survival of an impaired child imposes costs over a whole lifetime.

The importance of discounting has been discussed in the previous section. Where paediatric interventions have long term implications, the selection of a discount rate is likely to be critical and, as there is no 'correct' rate, evaluations should always test the sensitivity of findings to variations in discount rates. It might be argued that the discounting process discriminates against treatments with long pay off periods, but this tendency is corrected, at least partially, by the discounting of long term costs.

The discount rate should reflect the riskiness of outcomes. This is important in evaluating paediatric medicine in low income countries with high child mortality rates, where the

expected benefits of treatment are reduced by the probability that an infant may succumb to some other disease. This possibility is not usually considered in western countries where infectious diseases are no longer a major cause of mortality, but there are other problems in estimating the short and long term medical outcomes for infants.

In neonatal intensive care and in many other areas random trials cannot be conducted, so it is difficult to predict how infants might fare if they were not treated. Difficulties also exist in predicting the length and quality of life which an infant survivor might expect. Most severe impairments become evident at an early stage, but preliminary indications from a study of infants of low birth weight in the Mersey region, who are now aged 8–9 years, show that some disabilities, particularly deafness, were not detected at the age of 4 years. The study is also identifying quite major differences in physical and educational development between these infants of low birth weight and a control group (POD Pharoah, CJ Stevenson. Paper given at British Paediatric Association Annual Meeting, Warwick, 1990). Still subtler differences which might affect social integration and employment prospects may not become evident for some years to come. Long term follow up studies do not exist for many therapies, both old and new, so estimates of QALYs gained from a wide range of treatments must be subject to uncertainty.

Decisions to treat the unborn and the newly born infant are inextricably linked with consideration of the sanctity of life. This is not peculiar to paediatrics and bears equally on the care of the elderly and the terminally ill. However, perinatal care is special since the infant's preferences cannot be consulted and the neonatologist is, of necessity, bound to treat the family as well as the patient. A bald estimate of the QALYs which an infant might expect from treatment may therefore underestimate the value of medical output to the whole family.

One aspect of paediatrics is unique in medicine. Provided that parents are capable of producing other children, a paediatric intervention which saves a life is not a pure gain, since it might displace another child. Replacement demand is not much discussed in the economics of neonatal intensive care, but it has been considered in the literature on the economics of prenatal screening.^{8 9}

Scarcely any other medical field has produced such conceptual difficulties as the evaluation of prenatal screening. Some screening techniques are risky: two patients are involved; and the decision to terminate a pregnancy is complicated by the possibility of replacement. The benefits of screening have been taken as the costs averted by terminating a pregnancy which might have resulted in an impaired child. Legitimate though this may be where the exchequer costs of care are of prime concern, the real benefits of screening are found in the value of reassurance and the reduction of anxiety in mothers. In principle the QALY approach is best suited to the appraisal of this type of therapy, but a fully satisfactory evaluation of these

subtler effects requires far more sensitive measures of the quality of life than are currently available.

More generally, paediatricians may wonder whether existing measures of the quality of life are appropriate for their specialties. Most measures were designed for adults and do not take account of the costs and benefits of treatment to families. All illness imposes costs on families, but in paediatrics the decision to treat or not to treat can have profound pecuniary and non-pecuniary implications for parents and siblings as well as for the health services.

These strong interconnections between the welfare of the patient and the family complicate judgments on whose opinions should count in the allocation of care for children. The Oregon method attempts to reach a social consensus which could overrule the views of parents and in some circumstances this might be morally defensible. On the other hand, it might be thought that the views of parents should carry special weight, especially since in one study of neonatal intensive care parents judged some 'states of health' to be worse than death.⁴

The Oregon approach values alternative states of health by consulting public opinion. It was reported that the Oregon public gives high priority to preventive medicine, accident and emergency services, life saving therapies for chronic diseases, drug addiction and maternity care. Intuition suggests that in the UK there is a widespread sentiment in favour of the treatment of children over the elderly, and that most paediatric treatments would receive a relatively high priority, but no comprehensive opinion poll has been conducted.

Some qualms

An immediate objection to a priority system based on QALYs is that it offends against principles of equity within the NHS. This objection is weakened by the difficulties which exist in demonstrating that the NHS has reduced inequalities in health status. Nevertheless, a 70 year old patient who is denied heart surgery, and may never have used the NHS previously, is bound to reflect that he would have fared better under a private insurance system.

The Oregon system is also vulnerable on operational grounds. QALYs were always intended to be operational, but most health economists thought of the QALY method as an organising principle which would slowly gain acceptability as problems of measurement became better understood. Few economists would have proposed a full scale application of allocation by QALYs if only because the data requirements are so large.

A fully operational scheme requires the evaluation of all medical therapies and a large number of inputs to those treatments, such as alternatives in diagnostic techniques. Consideration should also be given to treatments which are not offered currently, perhaps because they are regarded as medically inefficient. It is entirely possible, for instance, that cheap drugs with rare side effects could be more efficient in QALY terms than more expensive safer drugs.

Many other options should also be considered. These include choices between preventive and curative medicine, hospital and community care, and alternative locations of care.

Health care evaluation must be a continuous process. Costs and technology change constantly, and the variables which enter into the QALY calculations can be altered by changes in staffing levels, management practices, and 'learning by doing'. To meet these data requirements even partially would require a huge input from clinicians, economists, accountants, and other health care workers. Allocative mechanisms currently in use may be inefficient and difficult to defend but at least they are administratively parsimonious.

Even if operational problems could be solved at a cost commensurate with the benefits of the Oregon scheme, other objections would remain. Estimates of the costs of QALYs gained are averages derived from statistical samples of patients. On this basis, treatments for infertility and neonatal intensive care for infants of very low birth weight were singled out in the television programme as therapies which might not be offered in Oregon. The treatments were said to be expensive and the outcomes uncertain, so on average the cost of a QALY is likely to be relatively high.

Averages may not be a good guide to the cost of gaining a QALY for a particular patient. It is suggested that neonatal intensive care might not be viable for infants of birth weight less than 1000 g, but in complex treatment, wide variance will be found in the cost of a QALY, and some cheap QALYs will be obtainable even in the lowest birthweight ranges. Studies of several cohorts of infants in the Mersey region have found no simple relation between birth weight and the cost of care¹⁰ and no statistical justification for the selection of 1000 g as the cut off point below which treatment was not justified.¹¹

It follows that rules based on average experience which threaten to replace clinical discretion may be inefficient. Clinicians treat individual patients rather than statistical averages and both medical and economic concepts of efficiency require treatment to be continued to the point where the extra (marginal) cost equals the

extra (marginal) expected benefits. In practice, marginal costs and benefits are difficult to measure but the principle is clear: if the benefits to be expected from spending an extra pound on a patient are valued at more than one pound, the treatment should proceed. It is interesting that the medical method of treatment by which patients are monitored, day by day, or hour by hour, conforms much more closely to this fundamental economic principle than does the application of a rule based on average QALYs.

The greatest fear is that a rigidly applied system of priorities, based on highly imperfect estimates of the cost of gaining a QALY, would turn from a economist's dream into a Stalinist nightmare. Eastern European experiments in planning failed because it was difficult to replace private initiative with rules. In the NHS, clinical freedom to pursue the best interests of individual patients may have to be constrained in the wider interests of society, but any such constraints must be broadly acceptable to the profession and the public. The Oregon experiment is audacious and has a logic which some will find compelling, but a full scale application of this approach seems premature in the present state of the art of health care evaluation.

- 1 Williams A. Economics of coronary artery bypass grafting. *BMJ* 1985;291:326-9.
- 2 Teeling Smith G, ed. *Measuring health: a practical approach*. Chichester: John Wiley, 1988.
- 3 Rosser R, Kind P. A scale of valuations of states of illness: is there a social consensus? *Int J Epidemiol* 1978;7:347-58.
- 4 Boyle MH, Torrance GW, Sinclair JC, Horwood SP. Economic evaluation of neonatal intensive care of very low birthweight infants. *N Engl J Med* 1983;308:1330-7.
- 5 Drummond MF, Ludbrook A, Lowson K, Steele A. *Studies in economic appraisal in health care*. Vol 2. Oxford: University Press, 1990.
- 6 Shapiro H. *Drugs, pregnancy and child care*. London: Institute for the Study of Drug Dependency, 1990.
- 7 Pharoah POD. Perspective and patterns. *Br Med Bull* 1986; 42:119-26.
- 8 Callan J. *The economics of prenatal screening*. University of York: University of York Centre for Health Economics, 1988. (Discussion paper 42.)
- 9 Phin N. *Can economics be applied to prenatal screening?* University of York: University of York Centre for Health Economics, 1990. (Discussion paper 42.)
- 10 Sandhu B, Stevenson RC, Cooke RWI, Pharoah POD. Cost of neonatal intensive care for very low birthweight infants. *Lancet* 1986;i:601-3.
- 11 Stevenson RC, Pharoah POD, Cooke RWI, Sandhu B. Predicting costs and outcomes of neonatal intensive care for very low birthweight infants. *Public Health* 1991;105: 121-6.