OHE briefing
No. 25 March 1989 50p

The Impact of New Medicines on Health Care Costs

BACKGROUND

The objective of medical care is to make people as healthy as possible. Over the past 40 years, since the National Health Service was established in Britain, medical progress – including particularly pharmacological advances – has greatly extended the scope for the health services to achieve this objective. However, this success has also led to steadily rising expenditure on the Health Service. As a result, there has been a very proper concern to ensure that this expenditure is as effective as possible. The latest Health Service Review (HMSO, 1989) has helped to concentrate attention on the need to ensure that the Service gives the best possible value for money. In particular, it has once again focused attention on the cost of pharmaceuticals.

Against this background, it is important to recognise that advances in therapy do not always increase costs. They can in some cases reduce other expenditure on the Health Service. The earliest Office of Health Economics booklet in 1962 drew attention, for example, to the savings for the Health Service from the control of tuberculosis (OHE 1962). The control of infectious diseases as a whole in the 1950s contributed a major economic 'bonus' to the National Health Service, to enable it to expand its newer treatments. There are, of course, also other substantial economic benefits from better treatment. These reduce the more general costs of sickness referred to in the Box on page 2. This *Briefing*, however, refers only to health service costs and to the direct savings which medicines can yield within the Health Service. These are real savings in economic terms, even though the resources which they release are quickly absorbed in the general expansion of medical care.

Before looking at these savings from the use of pharmaceuticals, it needs to be emphasised again that medical progress – including pharmaceutical progress – often adds to health service costs rather than reducing them. An obvious example is Retrovir for the AIDS syndrome. It is expensive, and it may prolong the period of even more expensive terminal care of patients before their eventual death. Of course, the development of a vaccine or a true 'cure' would indeed reduce costs: but at present the available pharmaceuticals may make the treatment of AIDS more prolonged and expensive.

Ironically, another example is the use of cyclosporin in heart transplant surgery. It has significantly improved the success rate. (In renal transplants, such success can be set against the higher cost of prolonged dialysis, but for heart transplant patients the alternative is death). Figure Two shows the survival rate at Harefield and Papworth Hospitals for the periods before and after the introduction of cyclosporin A. The probability of survival at one year rose from about 0.55 to about 0.81. However, within the health service, such an improvement adds to costs rather than reducing them. An 'unsuccessful' transplant patient who dies shortly after the operation costs only about £10,000; when, however, the use of cyclosporin results in a successful transplant, the patient will on average cost about £30,000 over a ten year span of expected survival, because of the continuing cost of immunosuppressive therapy and follow-up care (Buxton et al, 1985). There are very real savings for society, and for the individual and his family, from such success, but not for the Health Service itself.

Similarly, if more indirectly, the use of the new agents to prevent death from coronary heart disease will add to the Health Service costs. The generally elderly patients kept alive will often need continuing medical care for the general morbidity of old age. By contrast, a dead person costs nothing.

None of this, of course, argues against medical progress. It does however, mean that the following examples of savings from the use of medicines need to be seen against this background. It also explains why individual pharmaceutical companies have recently concentrated economic studies on the improved 'quality of life' as a result of treatment, instead of measuring merely financial savings.

THE COSTS OF SICKNESS

The costs of sickness arise in four main ways. First, there are the costs of medical care for those who are ill – that is, in Britain, mainly the cost of the National Health Service. Figure One shows that almost two thirds of the cost of the Health Service is incurred in hospital. Medicines account for one tenth of the total costs.

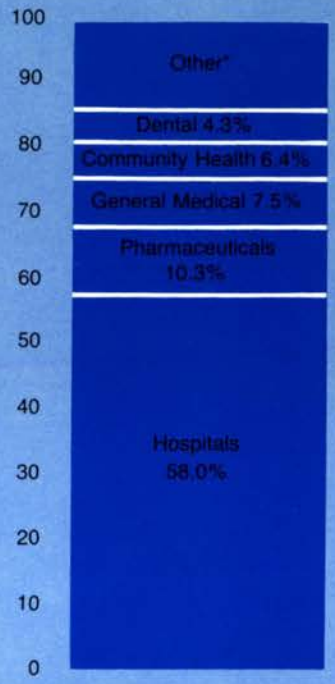
Second, the cost of sickness results from absence from work due to ill health. This cost is most commonly calculated as the loss of earnings of those who are ill. A larger figure can be produced by estimating the loss of production due to sickness absence. However, such figures have to be treated with caution. In a country where there is a significant level of unemployment, it is possible that at least long-term sickness absence may simply be an alternative to long-term unemployment. Nevertheless, it is common experience that individuals' absence from work due to ill health can often result in economic losses.

Third, sickness also results in a cost for the economy as a whole as a result of premature mortality. If an otherwise productive worker dies in his thirties, forties or fifties, many potentially productive years are lost. This has an economic cost by reducing the pro-portion of active workers in the community and increasing the ratio of 'dependents' to 'earners'. If significant numbers of potentially productive workers die prematurely, those who remain will each have to support a larger number of dependent children and old age pensioners. Once again, other factors such as changes in the birth rate can also influence this ratio but, nevertheless, the early death of a productive worker does have a real economic cost.

Fourth, there is the cost of suffering and disability for the patient and his family. Much medical treatment now benefits the elderly, who are already retired. Cynically, it can be pointed out that it would save money for the community as a whole if such patients died. However, economists very properly put a positive value even on an impaired and non-productive life. Much economic analysis is now concerned with quantifying the 'utility' of lives in the elderly, and this added value of prolonged life must be taken into account in considering the appropriateness of expenditure on medical care.

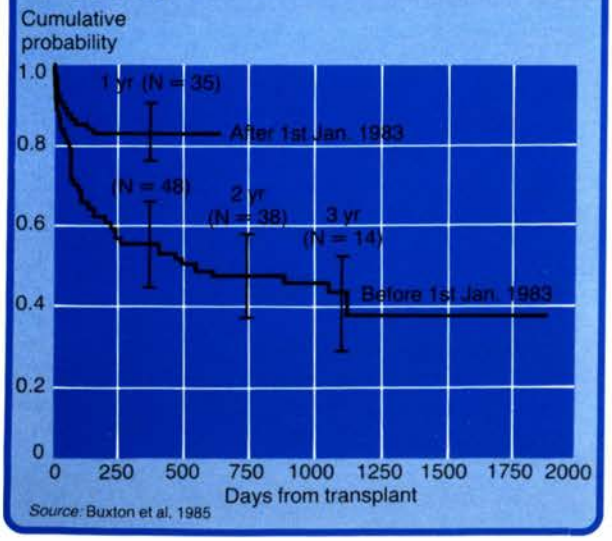
In a narrow sense, however, it is only the first of these costs which directly concerns the health service. The other 'costs' represent losses to society. They are not 'direct' costs. Of course, better medical care – and pharmaceutical advances – can substantially reduce these *losses* arising from sickness absence, premature mortality and suffering. For example, reduction in premature mortality from strokes, due largely to better treatment of hypertension, is estimated to have contributed an extra £322 million to the British economy in 1985 (Teeling Smith, 1988). Furthermore, pharmaceutical innovation adds to the national wealth through the contribution of pharmaceutical exports to Britain's balance of trade – a positive balance of about £900 million in 1988. Such positive contributions to the economy through the development of better medicines are extremely important. However, from the point of view of the health service it is the total cost of the service itself which is of primary concern. This *Briefing* therefore refers only to actual reductions in direct health care costs from the use of improved – and often more expensive – medicines.

Figure 1 *National Health Service percentage expenditures, UK, 1987*



* Includes administration and central services, such as ambulances, vaccines, research, laboratories, etc.

Figure 2 *Survival curves for heart transplant patients at Harefield and Papworth Hospitals (as at 30th September 1984)*



Source: Buxton et al, 1985

THE ECONOMIC SAVINGS

Over the years, economic analyses have shown a 'cost-benefit' pay-off to the health service from the use of medicines, using three broad approaches. The first is to look at the total savings for the National Health Service from the use of medicines in general. The second has been to look at the savings from the use of a broad group of particular medicines – for example the antibiotics. The third approach is to look at the savings from the use of a single individual medicine. The seven examples which follow are recent applications of each of these approaches.

First, looking at medicines as a whole, Teeling Smith and Wells (1985) published a study in the Pharmaceutical Journal which looked at the reduction in hospital costs under the NHS in England and Wales, as a result of pharmaceutical progress against asthma, epilepsy, glaucoma, hypertension, bronchitis, skin disease, tuberculosis, infectious diseases and mental illness.

Table One shows that the savings in 1982, compared to costs had there been no reduction in hospitalisation since 1957, amounted to £1,699 million. The study related this saving in hospitals to the total cost of *all* pharmaceuticals, including hospital medicines and dispensing fees, of £1,602 million. Of this, pharmaceutical manufacturers received only £1,225 million. Thus there is a 'cost benefit pay-off' of £474 million for the National Health Service. Although it has been widely quoted, this cost-benefit analysis has never been challenged, except to point out that the most substantial savings obviously related to pharmaceutical research undertaken some time in the past.

Looking specifically at the use of antibiotics in prophylaxis against post-operative infection in surgery, an extensive review of the literature was reported in a chapter in the OHE booklet 'Economic Evaluation in the Development of Medicines' (Drummond et al 1988). This concluded that every published study showed a financial saving to the hospitals as a result of the reduction of infections through the preventive use of antibiotics in surgery. Such studies included examples from Britain (Karren et al, 1985: Morran et al, 1978), from France (Renaud-Salts J L et al, 1985), from Germany (Daschner F, 1982), from Sweden (Persson U et al, 1986) and from the United States (Winslow I et al, 1983). Most significantly, one of the American studies quoted (Mandell-Brown et al, 1984) indicated that the use of the latest and most expensive cephalosporins would produce the greatest savings. For 100 patients, they estimated the extra cost of prolonged hospital stays caused by infections in 'control' patients receiving cefazolin at 251,210 dollars against an extra cost of only 6,800 dollars from the higher price of a third generation cephalosporin.

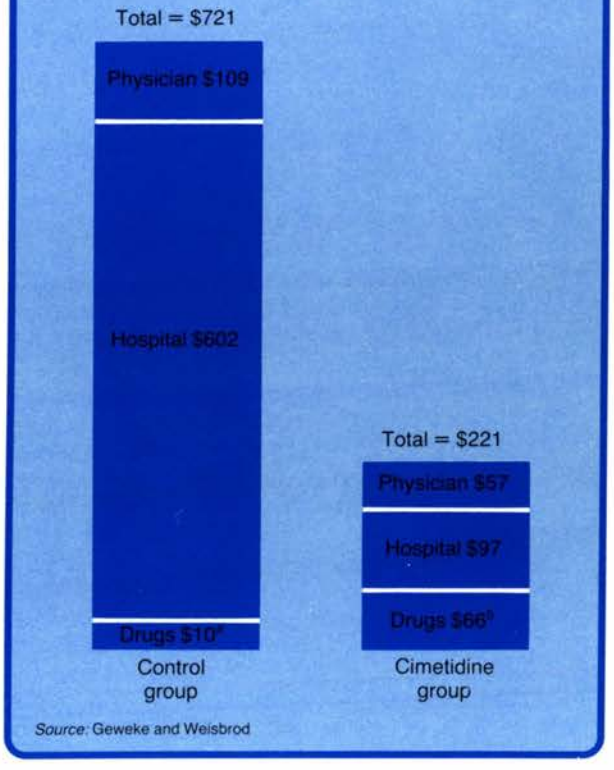
Another very recent study has examined the savings to the National Health Service from the reduction of strokes which has resulted largely from the successful control of hypertension. It is estimated from general practice statistics that if there had been no reduction since 1954/55 the number of new strokes per 1,000 population aged 45-64 would have been 2.4 in 1981/82 instead of the actual figure of 1.75. Without a reduction of this magnitude, it is estimated that the cost of strokes to the National Health Service would have been £754 million instead of £550 million in 1985. This saving of £204 million can be viewed against the total of *all* medicines for the treatment of hypertension of £185 million. Thus the saving to the health service from strokes alone more than pays for the cost of all anti-hypertensive medication (Teeling Smith, 1988).

Turning to individual medicines, the saving in hospital and surgical costs for duodenal ulcer as a result of the use of cimetidine have been extensively documented. The results of one such study, using computerised records of Medicaid in Michegan, are shown in Figure Three. This shows that individual patients in the group treated with cimetidine cost on average 221 dollars, against 721 dollars for individuals in the untreated group. The former figure included only 66 dollars for the cost of the cimetidine and other medications. Thus there was a 750 per cent pay-off from the use of cimetidine (Geweke and Weisbrod, 1982).

Table 1 *Savings from nine groups of diseases*

	Bed days 1957	*Bed days 1982*	*Hospital savings £ million*
Asthma	394,331	297,281	7
Epilepsy	500,053	247,352	19
Glaucoma	148,969	89,096	4
Hypertension	1,204,277	185,510	77
Bronchitis	1,262,028	471,459	60
Skin disease	1,122,385	996,204	9
Tuberculosis	6,886,552	106,323	509
Other infections	2,766,190	553,947	167
Mental illness	52,487,000	27,324,630	847
Total Saving			1,699
Manufacturers' cost of *all* pharmaceuticals			1,225
'Cost benefit pay-off'			474

Figure 3 *Average annual Michigan Medicaid expenditures per patient with duodenal ulcer. [a]Does not include antacids which are excluded from Michigan Medicaid: [b]includes cost of cimetidine therapy.*



Source: Geweke and Weisbrod

Another example from the United States is the use of rubella vaccination. The Massacheusetts Public Health Department (1979) noted that the distribution of the vaccine saved the public health agency 5.7 million dollars over a 10 year period. Incidentally, their study has been criticised because it failed to take account of the much larger savings to society as a whole.

As a sixth examples, a recent study at Brunel University has examined the economics of the use of transdermal glycerol trinitrate patches to reduce the cost of infusion failure in hospital patients. It found that at the current cost of the patches to the hospitals, there was an economic pay-off from their use provided the intravenous infusion was required for more than 48 hours. In these cases the cost of the patch was less than the extra cost of having set up new infusions in cases of failure. Once again, the very obvious benefit to the patient of not having to suffer the pain and inconvenience of a replacement infusion at a new site was excluded from the calculation in cost-benefit terms. (O'Brien et al, 1988).

The final example, like the use of antibiotics in surgical prophylaxis, illustrates the fact that the more expensive pharmaceutical preparations may actually *reduce* overall costs, although it will of course inflate pharmaceutical expenditures when these are judged in isolation.

Table Two shows that the use of carboplatin in place of the cheaper cisplatin for the treatment of cancer can prove less expensive in the long run because of 'its more favourable toxicity profile, easier administration and improved contribution to the quality of life of cancer patients'. Specifically, it allows out-patient therapy to replace costly inpatient treatment. Thus although the carboplatin costs £205.71 against £17.90 for the cisplatin, the total costs for treatments are reduced from £347.90 to £228.77 (Tighe and Goodman, 1988).

Table 2 *Comparative Costs (£) for Carboplatin and Cisplatin*

Item	*Carboplatin*	*Cisplatin*
Drugs		
Carboplatin 450 mg or cisplatin 100 mg	205.71	17.90
Dexamethasone 4 mg iv + 2 mg tablets × 4 for 4 days	2.34	
Metoclopramide 150 mg iv		3.60
Domperidone tablets 20 mg × 4 for 4 days	3.47	
0.9% iv saline*	0.55	3.30
Hospital bed	8.00†	324.00‡
Senior registrar's time (1 h)	8.70	
TOTAL	228.77	347.90

* 500 ml with carboplatin: 5 litres with cisplatin.
† One day or half a day: patient related plus non-patient-related costs.
‡ 3 inpatient days (including medical staff costs) in a radiotherapy unit: national 1985/86 figures uprated for NHS inflation.
Adapted from Tighe and Goodman

THE WIDER IMPLICATIONS

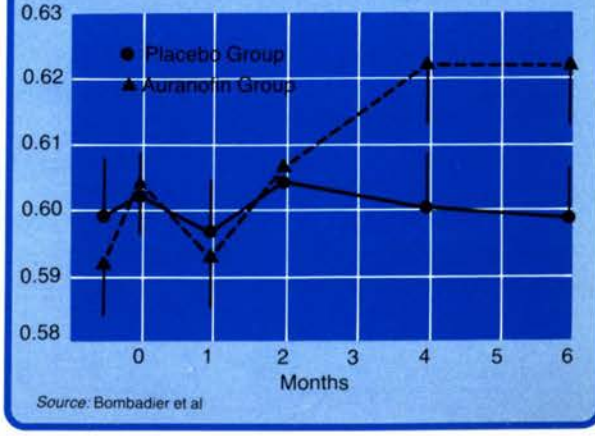
All these examples show how medicines as a whole, groups of medicines, and individually improved preparations can save the Health Service money. They indicate the cost effectiveness of medicines, in addition to their therapeutic benefits. These savings do not, of course, reduce actual expenditure. They release resources to be used in other ways within the health service. In addition, the early discharge of patients may have other costs for society if, for example, there are inadequate community facilities to support a mentally ill patient who has done well in hospital but who nevertheless cannot cope on his own in the community.

Indeed much work by the Office of Health Economics has been concerned with the quality of life of patients. There may sometimes be negative effects such as those mentioned in the previous paragraph, but pharmaceutical progress also brings many positive benefits for the individual.

The importance of the economic measurement of quality of life in patients has been fully discussed in Office of Health Economics publications (eg Teeling Smith, 1985). In cases of effective treatment in the elderly in particular, the benefits of therapy may come primarily in the form of relief of symptoms and extra years of life. Hence, in such cases the benefits are measured in terms of an increase in what have been called 'quality-adjusted life years' (QALY's). Figure Four, which refers to rheumatoid arthritis patients, shows the improvement in their score for the quality of life when they received treatment with the oral gold preparation, auranofin, instead of a placebo in addition to standard antirheumatic therapy (Bombadier et al, 1986).

However, what this brief paper has shown is that in addition to improvements in human well being, the appropriate use of modern and expensive medicines can also save money for the Health Service – altogether apart from savings for the economy as a whole. The rising expenditure on medicines under the National Health Service needs to be seen in perspective against the benefits which they can produce. There are sometimes useful financial savings to be achieved by the appropriate use of medicines. This is very much less often the case with other forms of treatment. From an economic point of view the cost of pharmaceuticals should be viewed more favourably than other medical and surgical

Figure 4 *Changes in health status as measured by the quality of well being scale, in rheumatoid arthritis.*



Source: Bombadier et al

costs. In many cases they will be more than paying for themselves and reducing the cost of sickness to the National Health Service.

Thus there is a paradox. Pharmaceutical costs continue to rise, and are often subject to special scrutiny. Yet in individual cases this rising expenditure may actually be reducing costs elsewhere within the hospital service. Hence there are great dangers in viewing pharmaceutical expenditure in isolation. The implementation of a 'cheap drug' policy may actually *increase* health service costs in some cases. The economics of the health service need to be seen in the round. This *Briefing* has attempted to focus on one aspect of the overall picture which is all too often neglected. The use of expensive medicines may in some cases release disproportionately larger amounts of resources for the benefit of patients as a whole. Pharmaceutical budgets need to take this factor into account.

Finally, apart from these immediate short-term savings from the use of medicines, there are the longer term effects where medicines and vaccines act in a prophylactic way to prevent future disease. The example of the control of hypertension to prevent strokes in the future is one such case. It is likely that further analysis will provide other examples where medical treatment today prevents morbidity occurring at some time in the future. Thus pharmaceutical treatment needs in some cases to be regarded as preventative medicine. The money spent on current pharmaceutical budgets can reduce costs in the future. This emphasises once again the danger of too much concentration on the reduction of expenditure on medicines. Pharmaceutical budgets may not only sometimes reduce current health service costs, but can also be an investment in positive health for the future, thus perhaps reducing long-term and very costly sickness.

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Office of Health Economics

The Office of Health Economics was founded in 1962 by the Association of the British Pharmaceutical Industry. Its terms of reference are:

To undertake research on the economic aspects of medical care.

To investigate other health and social problems.

To collect data from other countries.

To publish results, data and conclusions relevant to the above.

The Office of Health Economics welcomes financial support and discussions on research problems with any persons or bodies interested in its work.

Office of Health Economics

12 Whitehall London SW1A 2DY
Telephone: 01-930 9203

This Briefing was prepared by George Teeling Smith.