HALFWAY TECHNOLOGIES, QUALITY OF LIFE, AND AFFORDABLE PUBLIC HEALTH POLICY: BIOTECHNOLOGY DRUG DEVELOPMENTS FOR MULTIPLE SCLEROSIS

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Working Paper Series 2000-01

DEPARTMENT OF ECONOMICS
THE UNIVERSITY OF NEW BRUNSWICK
FREDERICTON, CANADA

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October, 1999

ABSTRACT
HALFWAY TECHNOLOGIES, QUALITY OF LIFE, AND AFFORDABLE PUBLIC HEALTH POLICY: BIOTECHNOLOGY DRUG DEVELOPMENTS FOR MULTIPLE SCLEROSIS

The cost control problems associated with funding half-way medical technologies in national health insurance systems are considered, in the context of analyzing the effectiveness, efficiency and equity implications of publicly funding the new biotechnology drugs for treating multiple sclerosis. It is suggested that, while lip service is played to all three types of assessment for formulating public policy, in practice decision-making is based on the effectiveness and efficiency evidence only. The consequence is an inability to formulate resource allocation decisions where distributional health effects among patients are involved.

The development of equity norms would not only generate more consistency and justification to distributional decisions, but also increase the ability of policy makers to make distributional choices explicitly in contexts where the implications of doing so implicitly are spiraling health care costs. For the purpose of increased cost control, almost any set of explicit equity norms would do, which does not mean to say that all equity norms are equally appealing, either philosophically or electorally. The development of explicit and socially acceptable equity norms is a high priority goal, even though their development requires more explicit judgements about what constitutes fair collective funding arrangements than either analysts or society have been want to make.

HALFWAY TECHNOLOGIES, QUALITY OF LIFE, AND AFFORDABLE PUBLIC HEALTH POLICY: BIOTECHNOLOGY DRUG DEVELOPMENTS FOR MULTIPLE SCLEROSIS

In part this paper represents a case study of a new technology for the treatment of multiple sclerosis (MS) -the biotechnology drugs capable of alleviating some of the symptoms of MS and sometimes slightly impeding the disease's progression, but only at substantial cost. However, it is a case study with a distinct orientation, insofar as it attempts to address a public policy funding issue common to most half-way health technologies, and for which the MS drugs simply represent a particular example. Consideration of the effectiveness, efficiency and equity implications of introducing the MS drugs into the health delivery system provides important insights into the general problems public policy makers face in trying to develop an affordable national health insurance (NHI) arrangement. The major policy question addressed is whether evidence-based medicine can become the mechanism for constraining health care costs to manageable levels (as many people believe), or whether it will simply become a new way of describing a technology-driven cost dilemma.

Consideration of the cost implications of prescribing biotechnology drugs hint at the nature of the affordability problem. Beta-interferon costs about $C17,000 per annum per patient, and there are between 50 and 200 MS sufferers per 100,000 people in most populations (with about 100 on average). Assuming that the $17,000 for beta-interferon involves no offsetting expenditure cuts, treating MS patients with beta-interferon costs about $1.7 million per 100,000 individuals, and generates benefits for 0.10% of the population. Publicly financing such drugs has the potential to increase medicare expenditures considerably. Consider the implications for New Brunswick, with

its population of approximately 800,000 and annual GDP per capita of $16,651 (in 1997). An increased annual public expenditure of $13.6 million would be necessary to support all NB's MS patients, increasing the provincial government's drug budget by about 5% *[CIHI, Table C4.1]*.

The funding situation is more complex than the above overview implies, and much of the subsequent discussion is devoted to spelling out details. But the question of whether it is effective, efficient, and equitable to divert economic resources to technologies where the benefits are expensive, and received by a small proportion of the population, remains integral to the public policy cost quandary even in the context of detailed benefit and cost assessments.

DRUG FUNDING IN CANADIAN NHI

The public funding arrangements for publicly funding drugs vary by province, in part because drug programs for ambulatory patients are not covered under the *Canada Health Act*, 1984. This means that the medicare principle of universal funding is not applicable to drug finance, allowing each province and territory to develop its own special funding arrangements.

While all regional governments publicly finance at least some drugs for some ambulatory patients, the schemes vary considerably in terms of the number of drugs insured, the proportions of the population covered, and the levels of co-payments levied. New Brunswick has had a prescription drug program (PDP) since 1975, involving prescription drug benefits for eligible provincial residents, although it is more accurate to describe PDP as a number of separate programs aimed at various population groups. These groups are identified in different ways - through demographic

characteristics (e.g., seniors), institutional characteristics (e.g., nursing home residents), health problems experienced (e.g., HIV patients), and economic situations (e.g., social welfare recipients)*[Health Services Review Committee]*.

The NB prescription drug programs constitute an integrated package insofar as they are all designed to identify patients in financial need, and to make the provincial government a payer of last resort. Cost control is in the first instance sought by allowing only clinically effective drugs on the formularies (which means only drugs with empirically confirmed health benefits), and efficient (which means that the health benefits of each drug introduced must exceed the benefits obtainable by investing in alternative drugs). Effectiveness and efficiency judgements are made through an Advisory and Utilization Committee, comprised mostly of physicians and pharmacists. The Committee reports to the Minister of Health and Community Services, and bases its recommendations on literature surveys measuring clinical effectiveness and economic efficiency. The clinical effectiveness judgements are based on clinical trials studies, and the efficiency judgements are based on health economic evaluation studies (of which, cost effectiveness analyses (CEA) and cost utility analyses (CUA) are most common, but sometimes cost minimization analyses (CMA) and cost benefit analyses (CBA) are available).

Unfortunately, a drug may seem to be effective and efficient without necessarily being affordable. When this happens, an important second line of defense for PDP is to modify eligibility arrangements and co-payment levels. However, cost driven changes in these features often generate inconsistent and difficult to justify equity effects.

MULTIPLE SCLEROSIS AS A DISEASE PROCESS

MS is a disease of the central nervous system affecting about 30,000 Canadians, two-thirds of them women [Otten, 1996: 1,4]. The age of disease onset is usually in the thirties. MS involves episodic neurological attacks including loss of coordination, sensory impairment, tremors, speech impairment, depression, cognitive abnormalities, fatigue, constipation, bladder dysfunction, and loss in sexual function; and secular increases in neurological deficits in relation to one or more of the above symptoms [Grudzinki et al.: 229-230]. While MS usually involves a secular increase in disability, it shortens life expectancy only marginally, with some of the shortening due to high rates of suicide among MS sufferers [Weinshenker:125].

The frequency of attacks tends to decline as the disease progresses, and tends to be highly variable among patients. There is a weak association between the number of attacks during early years of the disease and the time it takes for a patient to progress to a substantial level of disability (characterized by a EDSS level of 6 or higher) - 50% of patients reach a EDSS level of 6 within 7 years if they experience 5 or more attacks in the first two years, but only in 13 years if 2 to 4 attacks, and in 18 years if fewer than 2 attacks [Weinshenker: 129].

EDSS (expanded disability status scale) is a psychometric rating of neurological impairment, with scores ranging from 0 (normal function) to 10 (death from MS). EDSS measures progression of MS mostly in relation to mobility, upper limb, and bulbar functions [Parkin et al.].)

The major descriptors of the natural history of MS are based on the frequency of neurological attacks and remissions, and the time path of the chronic neurological deficits. In regard to these descriptors, a standardized nomenclature for the types of MS has evolved - (1) relapsing-remitting (RR),

characterized by periodic attacks (relapses) and a stable course in between; (2) secondary progressive (SP) characterized by gradual neurological deterioration with or without superimposed relapses in patients previously in the RR category; (3) primary progressive (PP), characterized by gradual and nearly continuous deterioration from the onset of symptoms; and (4) progressive relapsing (PR), characterized by gradual neurological deterioration during the early stages of the disease followed by long-run stability [Rudick:1605]. The RR and SP categories account for about 80% of all MS patients, with most starting as RR patients and gradually evolving to SP ones. The PP (chronic progressive) and PR (benign) categories each account for about 10% of all MS sufferers.

Benign MS is not a diagnosis but a prognosis. A person is considered to have benign MS if he/she has an EDSS score of 3 or less at 10 years from the onset of the disease [Weinshenker: 133].

It is generally felt that curing MS implies finding a treatment for RR patients so that full recovery can be promoted after attacks. It is also felt that eliminating attacks is a significant intermediate measure for curbing the secular physical deterioration of most MS patients. It is in the latter context that the biotechnology drugs with their impact on attack rates, have become of interest.

MS AS AN ECONOMIC BURDEN: THE PRE-BIOTECHNOLOGY DRUG SITUATION

The MS costs of illness (COI) are generally categorized into three major types - direct, indirect, and intangible. Direct costs include expenditures on drugs, hospital services, physician services, home care services, etc. Indirect costs identify production and welfare losses to society, measured through income losses to patients and their carers, disability payments, and lost income opportunities due to time spent receiving treatment, etc. Intangible costs measure the effects of disease and treatment on patients' quality of life [Grudzinski et al.: 230; Holmes; Canadian Burden of Illness Study Group].

COI estimates for MS are invariably crude, due to data limitations. For example, while intangible costs are often mentioned they are rarely estimated. Moreover, the costs that are estimated may involve some double counting. Consider the COI estimates for the United Kingdom found in Table 1. Indirect costs identify lost earnings, social security benefits paid to MS sufferers, and taxes not paid by MS sufferers because they are no longer working, although these items may be overlapping depending on how the series are defined.

Despite the limitations of the existing COI data, they provide some general insights. They indicate that the per patient costs of MS in the absence of the biotechnology drugs in developed countries are substantial, approximately equaling the level of per capita GDP. They also indicate that direct and indirect costs are of roughly equal importance in defining the total cost of illness.

Table 1 also suggests that comparing cost details between the United Kingdom and Canada is difficult, although this fact is not surprising. The two countries have quite different institutional arrangements concerning the funding of health and social services, and quite different relative prices. The same problems are experienced in most international comparisons, and in this regard it is worth mentioning that an American study using mid-1980s data found that annual family expenditures associated with having an MS sufferer ranged from $US 692 to $US 2,246, depending on the severity of the MS [Grudzinski et al.: 231]. Another American study, (based on Veterans Affairs VA) patients, estimated the cost of looking after an MS sufferer at $US 35,000, with VA benefits and home care costs accounting for 43 and 42% of total costs respectively [Grudzinski et al: 232].

TABLE 1

ANNUAL ECONOMIC BURDEN PER MS PATIENT, 1994;
CANADA AND THE UNITED KINGDOM
($C)

	Canada	United Kingdom		
		Minimal Disability	Moderate Disability	Severe Disability
Direct Costs	7,002	5,991	16,725	31,381
Hospital	*4,971*			
Other	*2,031*			
NHS (Nat. Health Service)		*838*	*1,580*	*10,688*
Private Expenditure		*5,153*	*15,145*	*20,963*
Indirect Costs	11,671	5,882	17,896	25,262
Lost Earnings	*8,221*	*1,455*	*4,335*	*6,197*
Other	*3,443*			
Soc. Sec. Benefits		*2,577*	*9,008*	*12,845*
Lost Taxes		*1,850*	*4,553*	*6,220*
Total Costs	18,673	11,873	17,896	56,643

Notes: (1) In general, Canadian and United Kingdom costs are collated differently, making comparisons difficult.
(2) In the UK case, social security benefits refer to the social welfare payments that are paid to individuals made poor through being MS victims.
(3) In the UK case, lost taxes refers to the estimated taxes that individuals would have paid if they had not lost work and income through being MS victims.

Sources:
(1) A. Nicole Grudzinski, Z. Hakim, E. Cox and J.L. Bootman (1999). "The Economics of Multiple Sclerosis: Distribution of Costs and Relationship to Disease Severity," *Pharmocoeconomics*, 15(3), 229-240.
(2) J. Holmes, T. Madgwick, and D. Bates (1995). "The Cost of Multiple Sclerosis," *British Journal of Medical Economics*, 8, 181-193.

In most developed countries, including the UK, USA, and Canada, hospital costs are the most important component of direct costs, and increase in importance as the number of relapses increases, and as the MS state becomes more severe. For ambulatory care, drug costs are the most important. Traditionally, corticosteroids have been the mainstay for treatment of MS acute relapses, prescribed to shorten relapse periods, and to accelerate recovery [Rudick et al: 1606-1607]. A Canadian study, measuring the use of drugs by senior citizens with and without MS in Nova Scotia from April 1993 to March 1994, found that the per person prescription cost was $975 for MS patients and $590 for all patients [Sketris et al.: 303-318].

EFFECTIVENESS OF THE BIOTECHNOLOGY DRUGS

Biotechnology drugs are a recent phenomenon, the first one appearing on the market in 1982. Three major biotechnology drugs have been developed to treat MS - interferon beta 1a (brand names: Avonex and Rebif), interferon beta 1b (brand name: Betaseron), and glatiramer acetate/copolymer 1 (brand name: Copaxone). The first biotechnology drug in general use for multiple sclerosis was Betaseron, approved in July 1993 by the USA Food and Drug Administration for prevention of acute attacks in ambulatory patients with an RR form of MS [Weinshenker et al.: 119]. The biotechnology drugs have a common characteristic in that they all are extremely expensive to prescribe.

Betaseron was tested using study/control group techniques prior to approval. These tests suggested a decrease in the exacerbations experienced during the first two years of the disease from 1.27 per

patient annually to 0.84, a 23% reduction in the probability of experiencing severe rather than moderate exacerbations, and a curtailment of the progression of the disease as measured through the EDSS instrument, albeit at only a 10% level of confidence [Otten, 1996: 1-2, 5]. The latter result was disappointing, insofar as the main therapeutic goal was to slow the progression of the disease, rather than reduce the frequency and severity of exacerbations.

Subsequent study/control group studies have yielded more positive results, as the study results cited in Table 2 indicate. The conventional wisdom for all the MS-oriented biotechnology drugs now seems to be that they both reduce exacerbation rates by around 30%, and slow secular deterioration, at least in the first three years from disease onset.

This is not to say that the above conclusions are completely uncontroversial. On conceptual grounds, it has been noted that the average MS patient not on biotechnology drugs does not spend a lot of time in relapse states, experiencing about 1.5 attacks of less that one month duration each in the first year, 1.1 attacks in the second, and fewer than 1.1 attacks annually in all subsequent years [Otten, 1998: 6]. Thus, while a reduction in relapse rates is important, by itself it improves the quality of life for patients for only a small proportion of the time. Concern has also been expressed that improvement in the secular progression of the disease over a two to three year time period is of limited value for a disease that lasts a lifetime. In this latter regard, a disturbing trend is that neutralizing antibodies to interferon develop in about 45% of patients by the third year [Drug and Therapeutics Bulletin: 10].

TABLE 2

SELECTED STUDY/CONTROL GROUP EVALUATIONS ON THE BIOTECHNOLOGY DRUGS FOR MULTIPLE SCLEROSIS

DRUG	INTERFERON BETA-1A	INTERFERON BETA-1B	GLATIRAMER ACETATE
STUDY	PRISMS Study Group (1998). "Randomized Double-blind placebo-controlled study of interferon Beta-1a in relapsing/remitting multiple sclerosis, *Lancet*, 352, 1498-1504.	The IFNB Multiple Sclerosis Study Group (1993). "Interferon Beta 1b is Effective in Multi-center, randomized, double-blind, placebo-controlled Trial, *Neurology*, 43, 655-661.	K. Johnson et al. (1995). "Copolymer 1 reduces relapse rate and improves disability in relapsing-remitting multiple sclerosis: results of a phase 3 multicenter, double-blind, placebo-controlled trial." *Neurology*, 45, 1268-1276.
SUMMARY	The first study to show an unequivical and statistically significant benefit on each of the four major outcome measures: the exacerbation rate, the EDSS secular progression rate, the exacerbation rate measured by MRI activity, and the disease burden as measured by the total volume of T2 lesion load on MRI. Given 18 MIU/wk. patients experienced two year declines of 27% for clinical attack rates, 19% for progression in clinical disability, 67% for MRI attack rates, and 12.1% for MRI disease burden. Also , there was a 24% decline in the number of patients with baseline EDSS>3.5.	Treatment reduced the relapse rate by 31%, increased the proportion of patients who were relapse free by 10%, and reduced by a factor of two the number of patients who had moderate and severe relapses. There was no difference in the proportion of patients in whom disability increased, or in changes in the disability scores between treatment groups. (There was evidence that long-run disability progression was lessened but this result was not statistically significant).	The annualized relapse rate, the primary end point, was 29% lower on the treated group, and the proportion of patients who did not have a relapse was higher (34% versus 27%). A greater proportion of patients in the treated group had an improvement of 1.0 point or more on EDSS (25% versus 15%), and fewer had worsening of disability (21% versus 29%).

On statistical grounds, a large number of concerns have been raised [Weinshenker: 119-129, 136-137]. The fact that there is apparent "stabilization" in many individuals recruited and on placebos, makes interpreting statistical results difficult. The fact that the end points are often small differences in disability states measured somewhat subjectively (such as one point on the EDSS scale) makes spuriousness in conclusions a problem. The fact that the best measures of secular effect relate to MRI measurements of lesion area or volume in the brain, while the relationship between such measurements and impairment is weak, constitutes a problem. The fact that patients selected for clinical trials because of high exacerbation rates are likely to return to the average attack rate over time with or without treatment (regression to the mean), means that the observed improvements in rates may not be treatment caused. Finally, if the exacerbation rates of study and control groups are too low naturally, they compromise the power of trials.

The trend in trial results (only three of which are reported in Table 2), suggests that the conventional wisdom about the effects of the MS-oriented biotechnology drugs are likely to receive increasing confirmation over time, as more is learned about optimal drug doses, and about the best way of designing study/control groups for evaluations. This means that there is a new set of drugs on the market that reduce MS exacerbations by about 30%, and slow disease progression somewhat (particularly when disease progression is measured diagnostically rather that through clinical symptoms). However, the drugs do not cure MS, and are extremely expensive to prescribe.

EFFICIENCY OF THE BIOTECHNOLOGY DRUGS

Judgements on cost efficiency are often based on cost effectiveness evaluations, which means that the costs are measured in relation to the units of effect produced. As has already been indicated, there are a variety of measured effects in respect to MS treatment, with MRI figures the most sensitive indicators of change, followed by relapse rates, and disability indicators the least sensitive. Costs have been measured more often in relation to the number of avoided relapses than to changes in MRI values or secular disability levels, relapses dominating MRI values because they better reflect clinical states, and dominating disability levels because they are easier to accurately measure.

The cost effectiveness estimates in Table 3, drawn from a *Technology Report* published by the Canadian Coordinating Office for Health Technology Assessment (CCOHTA)[Otten, 1998], are reflective of the results generated for the MS biotechnology drugs. In this case, the drug evaluated is Rebif which, when prescribed for 100 individuals in the early stages of MS, is estimated to eliminate 56 relapses over a two year period, and to significantly curtail the secular progression of the disease for 12 patients. Over the two years, the drug prescription cost is $3,400,000, but allocation of these funds reduces hospital expenditures by $287,280 (mainly because of avoided relapses requiring hospitalization), and reduces other medical costs by $151,848 (by maintaining 12 patients at a moderate level of disability where ongoing medical costs are lower). The net costs of drug prescriptions for 100 patients are therefore $2,960,872.

TABLE 3

COST EFFECTIVENESS OF TREATING MS PATIENTS
WITH REBIF
(Data relate to the Treatment of 100 MS Patients over Two Years)

	$
Drug Costs	3,400,000
Hospital Costs Saved through Relapses Avoided	287,280
Medical Costs Saved through Disease Progression Curtailment	151,848
Net Costs of Drug Prescription	2,960,872
Net Cost per Relapse Avoided	52,873
Net Cost per QALY Generated	429,734

Notes: (1) A QALY is a quality adjusted life year.
(2) It is estimated that the drug prescription expenditures per patient per year are $17,000.
(3) It is estimated that 28 relapses are avoided annually through drug prescription in a cohort of 100 patients. It is estimated that the cost of each hospital stay is $5,130.
(4) It is estimated that 12 patients will progress immediately to an EDSS level equal to, or greater than, 6 if they do not receive Rebif, and will retain an EDSS level less than 6 for two years or more if they receive Rebif. The estimated differential in treating severe versus moderate patients is $6,327 annually.
(5) It is assumed that each relapse lasts a month, and that the decrease in quality of life during a relapse is 0.5. This means that avoiding 56 relapses over a two year period has a value equal to 2.33 QALYs.
(6) It is assumed that the effect of avoiding the progression of the disease equals 0.19 QALYs annually per patient. This means that avoiding the progression of the disease for 12 patients over two years has a value equal to 4.56 QALYs.
(7) While the data are for a two year time period, no time discounting is applied.

Source: N. Otten (1998). *Comparison of Drug Treatments for Multiple Sclerosis*, Ottawa: Canadian Coordinating Office for Health Technology Assessment, December.

The above figures generate a net cost per relapse avoided of $52,873. The main problems with interpreting this figure are that relapse avoidance is only a part of the health effect of prescribing Rebif, and that avoided relapses are not directly comparable to effects generated by treating health problems other than MS.

A more ambitious assessment procedure involves estimating the number of quality adjusted life years (QALYs) generated by Rebif. The CCOHTA assessment assumes that each relapse lasts for one month, and lowers the quality of life to half the normal level while it persists. It also assumes that a patient with moderate MS generates 0.19 QALYs more per year lived than does a patient with severe MS. Under these assumptions, treatment of 100 patients over a two year period generates 6.89 QALYs - 2.33 through the relapses eliminated, and 4.56 through the secular deterioration avoided.

The net cost per QALY of prescribing Rebif is $429,734, a figure about average for all CUA estimates made for the MS biotechnology drugs to date - estimates ranging from $100,000 to $1,000,000 per QALY generated (Otten, 1998: 9). Analysts generally agree that a cost per QALY in excess of $100,000 is sufficiently high to make the investment problematic on efficiency grounds. But the exact criteria on which this judgement is made are somewhat fuzzy, the cost judged to be high mainly because there are many technologies capable of generating a QALY for less than $100,000. However, there is not a clear dividing line, defined either conceptually or empirically, differentiating between efficient and inefficient technologies.

Although the MS biotechnology drugs have been judged to be inefficient, all Canadian provinces have publicly funded the MS biotechnology drugs to some degree.

EQUITY OF THE BIOTECHNOLOGY DRUGS

While equity, along with effectiveness and efficiency, is the third "E" in economic evaluation, it is honored more often in principle than in practice. This means to say, it is standard to play lip service to the notion that a system should be equitable, but also standard to avoid specifying what this means by noting that equity is largely a subjective matter. Most agree that the absence of explicit equity norms is regrettable insofar as their absence is conducive to public policy mixes with inconsistent and indefensible equity implications; we go one step further by suggesting that the absence of explicit equity norms has contributed to an inability to cope with rapidly increasing health care costs.

As backdrop to our suggestion, it must be initially appreciated that efficiency is traditionally separated from equity in economic thought in a particular way. An efficient public policy is one that increases the welfare of some individuals in a population while lowering the welfare of none, while an equitable policy is one that increases the welfare of some individuals at the expense of others such that the social (or community) welfare can be judged to have increased. Thus CMA, which mainly reflects an effort to find less costly ways of producing the same things, is judged to be an efficiency evaluation procedure because it is designed to promote the largest economically feasible bundle of goods for distribution to individuals (*the nuances of this argument, and others relating to the notion of Pareto efficiency, are not discussed because they are complicated and advance little the public*

policy issues discussed in this paper). Cost efficiency analysis and cost utility analysis are comparable to cost minimization analysis in trying to find the least cost way of producing "something," only the "something" is a health effect rather than a market output. It is thus easy to think of CEA and CUA as primarily efficiency evaluation tools, but the equity overtones of the instruments become apparent with appreciation of the fact that health effects are not transferable among patients in the same way market outputs are transferable among consumers.

When considering whether QALYs should be generated from prescribing biotechnology drugs for MS patients at $100,000 or more per QALY, the opportunity cost of doing this is reflected in an infinite number of alternative funding allocations - more expenditures on organ transplants, on general practitioner care, on anti-smoking programs, etc. Whatever the funding decision, it involves both efficiency and equity effects - affecting efficiency through changes in the total number of QALYs available to the population, and equity through modifications in the distribution of QALYs among patients. Moreover, it is not possible to discuss the maximization of QALYs first on the assumption that the distribution of QALYs can be arbitrarily determined afterwards.

In economic theoretic terms, QALY maximization subject to a budget constraint implies a particular distribution of care, and consequently no analogue of the economist's compensation principle (used in welfare maximization models) can be brought to bear as a way of separating efficiency and equity policies.

CUA advocates have attempted to deal with the above matter by suggesting that the distribution of QALYs consistent with QALY maximization for a population is not only efficient but fair. They support an equity principle of providing health services to those most in need, with those most in need identified as those most able to benefit clinically from care [Williams; Russell; Fowler et al.]. This principle, which makes efficiency and equity objectives compatible, generates significant professional support, but fails to muster much support among the general public. Consider the situation of a doctor arriving at an accident scene where both a 20 and 60 year old are dying from blood loss, and there is time to save only one. Should the doctor save the younger one first because queuing this way generates more QALYs? Individuals surveyed on questions like this usually reject QALY maximization in favor of random selection [Nord et al.].

QALY maximization from resources allocated to health care may not only imply giving priority to the young over the old, but priority to women over men, rich over the poor, and individuals in dominant cultural/ethnic/racial groups over individuals in minority ones [Nord et al.]. The underlying equity principle may appeal to some, but obviously not to all. Moreover, this equity principle is fundamentally inconsistent with the objective of national health insurance, designed to create equal access to all without reference to ability to pay, or ability to benefit.

In general, it seems that efficiency and equity social goals are likely to be independent, even if the maximization of QALYs is not separable from its distribution, and in this context we can return to the original discussion about the role of explicit equity norms in defining health care cost control policies. Consider once more the effectiveness and efficiency evidence with respect to the MS

biotechnology drugs - evidence indicating that these drugs have some health benefits, increasing QALYs for MS patients at a cost something in excess of $100,000 per QALY. Based on such information alone, can the conclusion be drawn that the provinces are wrong (or right) in partly or fully funding MS drugs? We believe not, and the problem does not lie with the inadequacies of the effectiveness and efficiency information, although the inadequacies may be substantial. The problem lies in the fact that there is not an equity norm indicating how the health benefits of MS versus other patients should be traded off.

To solve the problem, almost any set of operational equity norms would do, which is not to say that all sets are equally appealing, either philosophically or electorally. However, this begs the question of what our particular equity norms might be. We are reluctant to express our preferences, recognizing that they are no more free of value judgements than anyone else's, and no more precisely worded to be universally applicable. More importantly, expressing our preferences may detract from our basic argument. But we are prepared to commit to the idea of not subsidizing patients in terms of health care treatments aimed primarily at affecting the quality (as opposed to quantity) of life, when the subsidization has potential for impoverishing the society in terms of the consumption of non-health goods. This preference follows from a perception that happiness is a function not only of health but also of wealth, and that in the long run wealth is a major determinant of health.

Applied to MS, our equity backdrop supports the view that the biotechnology drugs should not become a part of Canada's medicare philosophy, where the principle of universality is involved. The

judgement is consistent with that found in the CEA and CUA analyses [Laupacis et al.; Sheingold; Tolley et al.], but fortified with an argument that it is not equitable to subsidize patients with health care technologies that work minimally. Essentially, we are making a judgement that more pain and discomfort can be alleviated by treating other types of health problems than by universally funding the MS biotechnology drugs.

DISCUSSION

The perception of evidence based medicine as a mechanism for cost curtailment in NHI was an outgrowth of studies showing that much of what doctors and other health providers do is based on orthodoxy and tradition, without any methodical evidence showing health effects on patients. Eliminating such care was initially conceived as an efficiency policy with the potential for achieving two goals - better health care for patients, and lower costs for health care funders. The key to justifying evidence based medicine in terms of these two goals was to generate research showing that health care based solely on orthodoxy and tradition had little or no health effects.

After the fact, the effectiveness and efficiency studies have been more instrumental in identifying technologies where limited health benefits are generated at very high cost, rather than technologies where no benefits are generated at all. Since not all the half-way technologies are affordable, public policy has had to adjust to a reality that some health problems must go untreated, and some patients must tolerate a lower quality of life than is technically feasible. The choices are basically equity ones, and the fact that public policy makers have tried to make many of these decisions without any clearly thought out equity guidelines partly explains the public funding quandary.

Promoting effective and efficient health allocation decisions, while laudable, does not provide a basis for making all health funding decisions, nor does it guarantee an affordable system. Historically, doctors *de facto* made the decisions on who would live and who would die through their decisions on whom they would treat. Today, the question does not seem quite so stark. The more common question is whose quality of life will be augmented at public expense and whose will not. Because quality of life generated through health care is not clearly distinct from quality of life generated through other types of consumption, there is a basis for favoring public funding where the cost of creating QALYs does not exceed their production value. But this is clearly an observation based on a particular value norm - and analysts with other norms may suggest other dividing lines between publicly and privately funded health care technologies. Our main point is that any set of operational equity norms will contribute to defining a basis for distributional choices, and that a set of some sort is necessary for addressing the health care cost issue.

CONCLUSION

Judging that the MS biotechnology drugs should not be publicly funded does not imply that an exacerbation, or the secular physical deterioration common to MS, is something that some of us would wish others to tolerate. It is compassionate to recognize the problems MS sufferers have, but compassion is only a component of an equitable public funding process. Equitable decisions require recognition of situations where alleviating pain and discomfort for some increases pain and discomfort for others. Justifiable equitable decisions result when equity principles are in place allowing compatible and consistent decisions over all distributional choices that must be made.

In general, concerns about equity and distributive justice in health care must consider two policy effects. The first is the quantity and nature of the health benefits generated by a particular funding allocation, compared to the quantity and nature in a competing allocation. The second is the pattern of health benefits created by funding allocations among the poor versus the rich, the young versus the old, and the healthy versus the sick. The QALY literature largely addresses the first issue - with its view that population QALY maximization has imbedded in it an optimal equity rule (the QALY literature does not offer a solution to the question of how much should be spent on health versus other things, of course, but only a perspective about how the available care should be distributed among individuals). The second issue, with its implicit recognition that it may be more important for the state to provide QALYs to some individuals than to others, requires equity norms beyond those incorporated in the QALY paradigm.

Doctors and other medical professionals as individual providers have always had professional ethical systems postulating guidelines for their "caring" decisions. Our argument is that public policy funders need an analogous instrument - in the form of a set of explicit and operational equity norms. In the absence of this instrument, evidence based medicine will most probably simply become a new way of picturing the ongoing health care cost dilemma, notable only for its insight that the cost problem is technology-advance related.

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