

Opportunities for Improving the Cost-Effectiveness of Antihypertensive Treatment

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Hypertension is an extremely important public health problem, both medically and economically. The cost burden of treatment may significantly compromise care for the individual patient, while in aggregate the direct costs of antihypertensive treatment in the United States approach \$8 billion a year. Improved insurance coverage and efforts to control the costs of antihypertensive treatment are needed. Efforts to reduce the costs of care, with minimal or no reduction in its quality, should focus on the following: (1) limiting treatment to patients with sustained diastolic hypertension; (2) improving the efficiency of the delivery process; and (3) emphasizing "low-cost prescribing strategies." The uncertainty that remains over the risk-benefit ratio of pharmacologic treatment for patients with very mild hypertension (90 to 94 mm Hg diastolic) raises additional questions. Even if treatment of mild hypertension is effective, it is without doubt less cost-effective than treatment of moderate and severe hypertension. Is this cost worthwhile? Such trade-offs of cost and benefits will increasingly have to be confronted in the face of limited health care resources.

Policy makers, employers, and patients alike are ever more frequently expressing concerns over the high and increasing costs of health care and, perhaps more importantly, over whether these high costs are worthwhile in terms of resulting health benefits. Each group has its own views on the appropriate level of costs and on measures of benefit that are most valued. The message, nonetheless, is a consistent and undeniable one.

Particularly germane to this discussion is evidence that the cost burden of hypertension care may have deleterious effects on some hypertensive patients. This conclusion is suggested by the results of two surveys of physicians and patients conducted recently by the Gallup Organization [1,2], and is further supported by the Rand Health Insurance Study [3]. Yet another study, a survey of hypertensive patients in Georgia [4], has indicated that the cost burden of hypertension care is particularly onerous in patients who are poor and have moderate to severe hypertension.

Two primary options exist that may reduce the cost burden for the patient with hypertension. One is to reduce the costs of care, and the other is to improve insurance coverage. There is no question that we should pursue the goal of expanded insurance coverage for medications, office visits, and essential laboratory tests for patients with moderate or severe hypertension. More controversial, but equally important, however, is the simultaneous need to explore opportunities for controlling the costs of care. Some physicians argue that trade-offs between cost and quality are inevitable, and that cost-control initiatives (those that are already in

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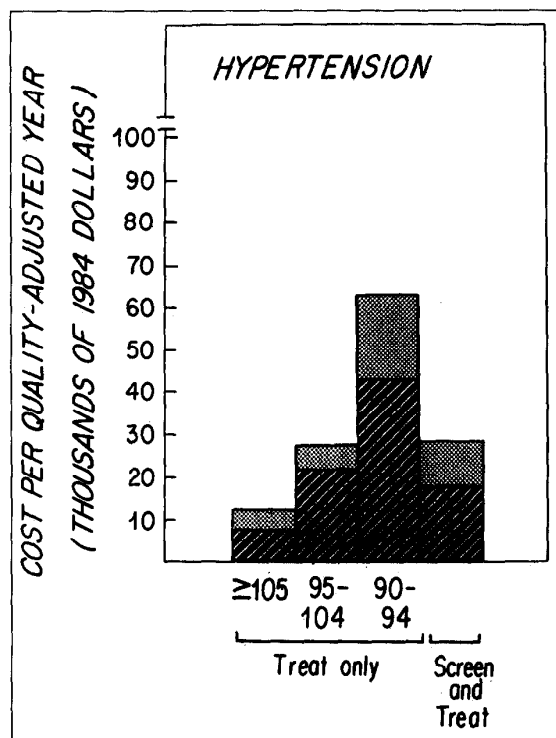


Figure 1. Cost-effectiveness of hypertension detection and treatment (1984 dollars) for sustained diastolic hypertension or screening and treatment of all persons with diastolic blood pressure of 95 mm Hg or above. Full adherence (dark cross-hatched areas) and expected adherence (light cross-hatched areas) are shown. Reproduced with permission from [5].

place and those being contemplated) will necessarily reduce the quality of care. But is this really so?

In support of the argument for greater cost control, this article will first review the magnitude of the hypertension problem from an economic perspective; second, highlight several findings from our study of the cost-effectiveness of hypertension detection and treatment; and finally, suggest some opportunities for reducing the costs of care.

COST OF ANTIHYPERTENSIVE TREATMENT

The cost of treating cardiovascular disease in the United States in 1986 has been estimated by the American Heart Association to be \$78.6 billion. This figure includes medical and long-term care expenses and indirect costs due to reduced productivity from disability, but it omits the very real costs associated with premature deaths from stroke and myocardial infarctions. Perhaps as much as a third of the total costs of cardiovascular disease may be attributed indirectly to hypertension through associated, accelerated rates of stroke and other cardiovascular events.

At an average annual treatment cost of \$400 per patient, nearly \$8 billion is being spent directly each year on

the treatment of hypertension in the United States, and the pharmaceutical industry estimates that \$3.7 billion was spent worldwide on antihypertensive medications in 1985. No matter how they are examined, the economic consequences of hypertension are enormous. This fact underscores the importance of vigorously pursuing opportunities to reduce the adverse health impacts of hypertension while at the same time using the resources devoted to its treatment wisely.

COST-EFFECTIVENESS OF ANTIHYPERTENSIVE TREATMENT

Cost-effectiveness analysis permits one to examine the relationship between the costs and benefits of treatment, thereby providing a yardstick by which to compare one health care program with another or to compare the treatment of hypertension with the treatment of other conditions, such as cancer or coronary artery disease. In our studies, we have expressed cost-effectiveness ratios in terms of dollars per quality-adjusted years of life, an important but complicated concept that encompasses both patient preferences for the quality of their lives and a consideration for the length of those lives. A lower cost-effectiveness ratio indicates relatively greater cost-effectiveness.

If resources are limited, the cost-effectiveness argument would suggest that funds should be allocated first to the most cost-effective program and then to progressively less cost-effective programs until resources are exhausted. Obviously, many influences other than cost-effectiveness considerations will affect the decisions that are actually made.

To examine the cost-effectiveness of treatment for hypertension, we used the results of the Framingham Heart Study [5] to estimate the morbidity and mortality benefits of blood pressure control. Costs included the direct costs of antihypertensive treatment less the savings that resulted from preventing strokes or myocardial infarctions caused by untreated hypertension.

Three conclusions from our study are particularly relevant to this symposium. First, we found that antihypertensive treatment does not save medical care costs. Only 22 percent of the treatment costs for moderate hypertension and 15 percent of those for mild hypertension were offset by savings from the cardiovascular events prevented. The cost of treatment, therefore, can only be justified in human terms: in lives saved and in reduced disability.

Second, it was found that the cost-effectiveness of antihypertensive treatment is directly related to the pretreatment level of blood pressure. As shown in **Figure 1**, the cost-effectiveness ratios ranged from about \$12,000 per quality-adjusted year of life gained for patients with pretreatment pressures in the moderate range (pretreatment diastolic blood pressure 105 mm Hg and above) to more than \$60,000 per quality-adjusted year of life in those with very mild hypertension (90 to 94 mm Hg diastolic).

Third, it was found that the problem of maintaining life-long adherence to treatment markedly reduces both the effectiveness and the cost-effectiveness of care. Many factors influence adherence, among which are side effects of the medication, the convenience of treatment, and the costs of treatment.

OPPORTUNITIES TO REDUCE COSTS

Opportunities to reduce the costs of antihypertensive care revolve around decisions concerning who is treated and the drug treatment prescribed, as well as the efficiency and effectiveness of the care delivery process. A few examples will serve to highlight some possibilities.

Cost savings, without sacrifices in the quality of care, almost certainly would result if pharmacologic treatment were reserved for those patients with sustained elevations of blood pressure documented at multiple office visits. As many as a third of all patients with elevated blood pressure at one office visit will have normal blood pressure at subsequent visits [6]. Although there may be a risk of sustained hypertension developing in such "labile hypertensive" patients, the benefits of antihypertensive treatment in such patients have never been demonstrated. The Gallup survey, reported at this symposium, indicates that as many as one third of all physicians proceed with drug treatment for patients with diastolic blood pressures in the 90 to 99 mm Hg range at the first office visit. If this finding is representative of the United States as a whole, as many as 10 percent of the people being treated for hypertension (one third times one third), or well over one million Americans, are receiving antihypertensive treatment needlessly. The potential for cost savings is obvious.

Uncertainties that persist over whether the benefits exceed the risks of treatment in the large number of patients with very mild hypertension (90 to 94 mm Hg diastolic) suggest further potential for cost savings. Particularly when quality-of-life issues are considered, conservatism in offering pharmacologic treatment to these patients may be warranted on risk-benefit grounds, let alone cost-benefit ones.

Improving the efficiency of delivery of antihypertensive care provides still another opportunity to reduce costs. A study we performed on the cost-effectiveness of care in more than 3,000 patients who were under the care of a network of United States Veterans Administration clinics provides some interesting insights in this regard (Table I). After controlling for patient characteristics, we found that shorter and less frequent clinic visits, shorter clinic waiting times, and greater provider productivity (measured as the number of yearly visits per full-time staff position) were all independently associated with lower costs. These findings are not surprising, but they do serve to identify clinic characteristics that are subject to managerial control.

Other more subjective variables, such as the level of job satisfaction of the clinic director, his or her perception of support by superiors, and the degree of responsibility for

TABLE I Clinic Characteristics Associated with Ambulatory Care Costs or Treated Diastolic Blood Pressure in Veterans Administration Hypertension Clinics

Variable	Direction of Association*	
	Cost	DBP
Clinic waiting time less than 15 minutes	-	-
Length of visit	+	NS
Time spent counseling	NS	-
Clinic director satisfied	-	-
Clinic director feels supported	+	-
Hypertension therapist has one supervisor	NS	-
Hypertension therapist feels supported	NS	-
Hypertension therapist cultures throat	+	NS
Clinic director treats patients	+	NS
Visits per FTE	-	NS
Visits per patient year	+	-

DBP = diastolic blood pressure; NS = not significant; FTE = full-time equivalent.

*Results of a multiple regression analysis that also controls for patient characteristics. Associations are at $p < 0.05$.

TABLE II Average Costs of Treatment in Veterans Administration Hypertension Clinics (1981 dollars)

Visits	\$158
Medications (step 1-38 percent; step 2-41 percent)	\$118
Laboratory tests	\$ 49
Total ambulatory costs per patient-year	\$325

clinical decisions that was delegated to non-physician hypertension therapists, were also important predictors of costs. Several of these clinic characteristics were also associated with better blood pressure control. "Shorter clinic waiting time" is especially interesting, because it appears to be related both to better blood pressure control and reduced costs.

The costs of antihypertensive treatment in these Veterans Administration clinics (Table II) averaged \$325 per patient-year of care in 1981 dollars, or approximately \$435 in 1986 dollars. Nearly half of these costs (49 percent) were for office visits, and more than one third (36 percent) were for medications. Medication costs significantly underestimate those for the average patient with hypertension, because the Veterans Administration obtains drugs more cheaply than could an individual patient.

Opportunities to reduce the costs of antihypertensive care through judicious selection of medication regimens are especially appealing. Costs vary widely among classes of drugs and between generic and trade name alternatives. Moreover, some antihypertensive drugs may require the additional use of relatively expensive potassium supplements. Hydrochlorothiazide costs about \$15

TABLE III Potential Cost Savings from a "Cost-Saving" Treatment Strategy

Regimen	Cost per Year* (dollars)
A. Generic diuretic plus potassium chloride supplements in the 20 percent of patients in whom hypokalemia develops	51
B. Potassium-sparing diuretic (Dyazide)	97
C. Generic beta blocker (propranolol)	138
D. Captopril	422
Cost per year with regimen changes†	
A	125
B	162
C	175
D	402

*Based on Red Book Update, August 1986, plus 10 percent, plus \$2.00 pharmacy fee per 100 units dispensed.

†Assumes regimen changes due to adverse drug reaction rates of 20 percent for diuretics, 13 percent for beta blockers, and 8 percent for captopril. The therapy of patients experiencing side effects with captopril is changed to regimen A. The therapy of patients receiving regimens A, B, or C who experience side effects is changed to captopril.

per year of treatment, potassium supplements \$85 to \$225, potassium-sparing diuretics about \$100, beta blockers \$200, and angiotensinase inhibitors \$400 at current prices. Calcium channel blockers have not yet been approved by the Food and Drug Administration for use as antihypertensive drugs, but their costs would be even higher than angiotensinase inhibitors because of multiple daily dose requirements.

A reasonable cost-saving strategy would be to start treatment with a diuretic and to proceed to more expensive medications only if side effects develop. Side effects sufficient to require discontinuation of medications occur in 20 to 30 percent of all patients [7,8]. A recent study that compared methyl dopa, propranolol, and captopril found withdrawal rates due to adverse reactions of 20, 13, and 8 percent, respectively [9]. This latter study, unfortunately, did not include a direct comparison with diuretics, the most commonly prescribed step-one drug in antihypertensive treatment. This cost savings, therefore, would probably be successful in nearly 80 percent of the patients receiving monotherapy. The same principles could be used to select the multidrug regimens, when they are required for adequate blood pressure control.

A simplified example will illustrate the potential cost savings of such a strategy. As seen in **Table III**, four first-step treatment regimens could be envisioned for patients with hypertension. Assuming the adverse drug reaction rates reported by Croog et al [9] (and a relatively pessimistic 20 percent rate of severe side effects for diuretics alone), the cost per year of treatment would range from \$125 under regimen A (generic diuretic plus supplemental potassium in 20 percent of patients) to \$402 under regi-

men D (captopril). These figures (comparing regimens A and D) would extrapolate to cost savings of \$277 million dollars per million patients treated. Unless the additional costs of captopril (or calcium channel blockers) can be rationalized on the basis of better blood pressure control or improved quality of life (and currently available evidence does not adequately support either circumstance), the argument is convincing from a cost-effective perspective that diuretics should remain the first line of treatment.

TRADE-OFFS OF COST AND QUALITY

Finally, trade-offs of cost and quality need to be considered in situations where marginal benefits are purchased, but at a relatively higher price. One such trade-off involves the pharmacologic treatment of patients with very mild hypertension. Even if treatment is effective in these patients, it is undoubtedly less cost-effective than the treatment of more severe hypertension. From a policy point of view, the question is whether treatment of very mild hypertension is a good use of resources. The results of the British Medical Research Council Working Party study of the treatment of mild hypertension (90 to 109 mm Hg diastolic after three screenings) highlight this dilemma [7]. In this trial, stroke incidence was reduced by 60 percent in treated patients, but coronary events and mortality were not significantly different in the treated and placebo groups. The decrease in stroke rates in the treated group was equivalent to preventing one stroke annually for every 850 patients treated. If treatment costs were \$400 per year, each stroke prevented would cost \$340,000. Is this a good value? Opinions will vary.

COMMENTS

There is no question that hypertension is an extremely important public health problem, both medically and economically. Medications are available that can safely and effectively lower blood pressure and reduce the risk of mortality and morbidity. The challenge to physicians, patients, and policy makers alike is to use—or facilitate the use of—treatment in a manner that will balance expected health benefits and the cost burden to the individual patient and to society.

Opportunities do exist for reducing the costs of treatment with minimal or no sacrifice in the quality of care. Among these alternatives, two deserve our special attention: limiting treatment to patients who are most likely to benefit from it and emphasizing the use of the least costly medications compatible with successful blood pressure control and good side-effect profiles. At a societal level, full insurance coverage for patients with moderate or severe hypertension is a goal that needs to be actively pursued as well.

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