ROLE OF INDUSTRY IN PREVENTIVE CARDIOLOGY

Cost Effectiveness in Hypertension Management

William B. Stason, MD, MS

INTRODUCTION

I am here today to ask you to rewrite the Hippocratic Oath. As the slide says: I swear by Apollo, the physician on Aesculapius, and Health and All-heal, and all the Gods and Goddesses that according to my ability and judgment - and cost considerations - I will keep this oath and stipulation. Consideration of costs in the delivery of medical care is controversial, and, for some, even untenable. After a recent presentation on cost-effectiveness analysis, an irate physician rose from the audience to claim that it was his duty to provide everything possible for every patient, regardless of costs, and that consideration of costs was incompatible with high-quality medical care. Perhaps some of you support this point of view.

This afternoon I would like to argue for cost consciousness by physicians; to indicate how cost-effectiveness principles can be applied to one important problem in preventive cardiology, namely, hypertension; and, finally, to suggest some means by which the cost of care for hypertension can be reduced without loss of quality.

Imperative for Cost-Consciousness--

If medical care were free and medical resources were unlimited, there would be no need to deviate from the dictum of "everything for every patient." Unfortunately, such is not the case. Medical care is not free. What the patient doesn't pay himself, his employer or the taxpayer does. Furthermore, medical resources are not unlimited. No one sees this more vividly than you do as your busy office schedules erode away your evenings and weekends or when scarcity of hospital beds delays a necessary hospital admission. Under conditions of limited resources, costs are important and priorities do have to be set. Everything possible cannot be done for every patient. My guess is, in fact, that you, in your practices,

set such priorities daily as you allocate more or less of your time to one patient or another based upon your assessment of the needs of the patient and your ability to benefit him. The question, really, is not whether cost-effective clinical decision-making is necessary and ethical, but rather one of who makes the decision and where and how the line is drawn. My argument, fundamentally, is that priorities should be set such that the maximal health care benefits can be realized per dollar spent, per hour of your time expended, or per hospital bed-day utilized.

The pressure for cost-containment in medicine is real and growing stronger day by day. We hear it from the government, from employers, and from patients alike. The only question is how it will be implemented; whether from Washington by establishment of caps on hospital revenues, limitations on hospital beds and diagnostic facilities, constraints on reimbursement under national health insurance, and tighter control on technology, or from within the medical profession through efforts by physicians to improve efficiencies of their office practices and hospitals and by efforts to ensure allocation of medical resources to patients most likely to benefit from them. I, personally, would much rather see decisions about health care made by those most qualified to make them, namely, by health professionals. Greater cost-consciousness by physicians and explicit consideration of costs in the making of clinical decisions are critical elements in this process. Systematic consideration of costs in cost-effectiveness or cost-benefit analyses, as I will discuss today, can also help by increasing awareness of the problem and by providing some insights into how cost containment might be achieved.

HYPERTENSION

Hypertension provides an interesting case in point. What are its medical and economic consequences? There is no doubt that it is an important health problem. Upwards of 24 million Americans have blood pressures above 160/95 mm Hg. The consequences of elevated blood pressure, as you all know, are enormous in terms of increased risk of cardiovascular disease, premature death and disability. Industry has a special interest because of the lost productivity that results and the necessity to replace key employees who are lost prior to normal retirement ages. For industry, the expense of training skilled personnel may well warrant considerable

efforts to ensure that hypertension is detected early and treated effectively. Efforts to reduce stress in the work environment, encourage exercise and cultivate healthy dietary habits may well be more cost effective than many other measures that result from executive decision.

How good a use of medical resources is the treatment of hypertension? What would be the health consequences if all hypertensives were provided life-long, effective treatment? At what cost? Definitive answers to these questions are not available. What is possible, however, is to present a framework from which tentative answers can be obtained and from which more conclusive answers may be developed in the future as better data become available.

Costs--
First, what are the costs of treating hypertension? Direct medical care costs, including the costs of medications, physician time and laboratory examinations are by all odds the most important. For essential hypertension these can range from $100 to well over $400 per patient per year with the costs of medications, in most instances, being by far the major item. These figures exclude costs of detection and initial diagnostic evaluation. The latter, as you well know, may be considerable. Because treatment is generally life-long, life-time costs for an individual may amount to many thousands of dollars. Treatment of hypertension is by no means a free ride

Table 1. Net cost

Direct medical care costs
Indirect costs
Savings in morbidity prevented
Costs of treating side effects
Costs of health care in added years of life

On a national level, if all persons with sustained blood pressures of 165/95 mm Hg or above were treated, direct medical costs would be in excess of $5 billion per year. To this would be added the costs of monitoring perhaps 15 million individuals with transient or borderline hypertension.

To these direct costs must be added the indirect costs of treating medication side-effects, such as depression or acute gout, and the costs of treating diseases that would not have occurred if the patient had not lived longer as a result of treatment of hypertension.

On the other side of the ledger, credit must be given for savings in the medical costs required to treat the cardiovascular morbid events that will be prevented by treatment, especially strokes and myocardial infarctions. These, in a sense, are the costs of not treating hypertension. Ignoring the problems of maintaining long-term treatment, we estimate that only about 30 percent of treatment costs would be recovered. When problems with adherence are taken into account, this figure, undoubtedly, would be much smaller. The excess medical care costs incurred, therefore, must be justified in terms of the increased longevity, reduced disability, and improved productivity or quality of life that result.

Benefits--
Benefits of treatment can be measured in many ways. Years of increased life expectancy are, probably, the most important, but the quality of those years also needs to be considered. Pain and suffering, limitations on active work or leisure time activities, and the side-effects and inconveniences of treatment all detract from the quality of one's life (Table 2).

Table 2. Net effectiveness

Increased life Expectancy
Improved quality of life from morbidity prevented
side effects of treatment

There are many problems in measuring the benefits of anti hypertensive treatment. The most important is that we don't really know how effective treatment is. To what extent does successful contol of blood pressure reduce the risk of early death, myocardial infarction, or stroke in a hypertensive? Does it reduce this risk to that of a person who has been normotensive all his life, or

does it only partially reduce this enhanced risk? Furthermore, to what extent does this reduction of risk depend upon the duration of treatment, the age at which treatment is begun, and on the degree of blood pressure control achieved? The answers to these questions are not known with any certainty. Treatment of mild hypertension provides a special problem because of the enormous number of patients involved - 70% to 80% of hypertensives have DBP less than 105 mm Hg - and the lack of definitive evidence that treatment is effective. Even if it is effective, its benefits may be outweighed by the risk of medication side effects and the costs and inconvenience of treatment.

The other major problem is that of measuring quality of life. In some analyses, the quality of life is equated to absenteeism from work and is, therefore, measured in terms of lost wages or productivity. Hypertensives appear to experience nearly twice the absentee rates of the general public. Whether this higher rate can be attributed directly to disability resulting from hypertension, however, is not clear. A recent study suggests that the mere fact of being labelled as a hypertensive and being treated for it increases absenteeism, in the absence of any evidence of physical disability. Absenteeism data need to be interpreted with these possibilities in mind.

Another way to measure quality of life, and the way we have chosen, is to get individuals to subjectively estimate the tradeoff between years of life and disability by evaluating responses to the question: "Taking into account your pain and suffering, immobility, age and lost earnings, what fraction of a year of life would you be willing to give up in order to have good health for the remaining fraction of the year instead of your present level of disability for the full year?" An answer near one implies that the disability is nearly as bad as death; and answer near zero, on the other hand, implies a mild or negligible level of disability. This tradeoff, admittedly difficult, is not impossible. Wouldn't you agree, for example, that a year of life with severe angina pectoris, is worth less than a year of life with full health? Wouldn't you be willing to trade a bit of your remaining years of life to be free of such symptoms? My guess is that you would. The question is, how much? Similarly, the adverse side-effects of treatment must surely be considered in evaluating the net effectiveness.

Cost-Effectiveness of Treatment--
Having discussed some of the issues involved in measuring the costs and the benefits of treatment for hypertension, how then can we combine these to give an answer (or answers) to the question of: "How good an investment is treatment of hypertension?" In one approach, so called benefit-cost analysis, all benefits, as well as costs, are expressed in economic or dollar terms. Thus, the cost of a premature death or disability usually is valued in terms of lost earnings. The ratio of benefits to costs is calculated, and if this is greater than one, the argument is made that the program should be undertaken; if it is less than one, the program should not be undertaken. The problem with this kind of analysis is in the need to assign a dollar value to a year of life or a day of disability. Difficult questions arise. For example, should all years of life be valued equally, or should the value of a year of life vary with the earnings of an individual? This dilemma is especially keen for housewives and for retired or unemployed individuals. An alternative approach, that we find more attractive, is to express results in terms of the dollar cost per year of life saved or per year of life adjusted for its quality. The tradeoff between dollars and lives is, therefore, avoided and anyone interpreting the results is free to make his own judgment as to what the value of a year of life should be. This is cost-effectiveness analysis. The lower the cost-effectiveness ratio, the higher the priority the practice in question should have.

In a benefit-cost analysis performed by the National High Blood Pressure Education Program, it was found that, for hypertensives aged 35 to 64 with diastolic blood pressures of 95 mm Hg and above, the overall benefit-cost ratio was 1.24. The benefits of treatment were found to just about equal the direct medical care costs, but costs savings from the treatment of cardiovascular events increased the ratio by the additional 24 percent. Informally, I've been told that this ratio has been revised upward in a subsequent analysis. By the standards of cost-benefit analysis, then, treatment of hypertension does look like a reasonable investment.

How does this compare with the results of our cost-effectiveness analysis? Despite striking differences in the methodologic approach, the results, overall, are remarkably similar. Figure 1 presents the estimated cost-effectiveness of treatment by sex, age, and pretreatment level of diastolic blood pressure. Full adherence

of patients to treatment is assumed at this stage, but the problem of non-adherence will be considered shortly. Remember that the lower the value of a cost-effectiveness ratio, the higher the priority in terms of maximizing benefits from a given health expenditure. Results are discounted to account for the fact that both costs and benefits accrue over the lifetime of the patient.

For both sexes, cost-effectiveness is inversely related to the pretreatment level of blood pressure. This is certainly not unexpected. For a 40-year-old woman, for example, treatment of a diastolic blood pressure of 100 mm Hg results in a net cost of about $10,000 per year of quality-adjusted life expectancy saved while for 110 mm Hg, the estimate is $6,000.

Important differences between men and women are also evident. For men, at each pretreatment level of diastolic blood pressure, cost-effectiveness decreases with age, implying that resources are more efficiently used in younger men. The converse is true for women, due to the later occurrence of strokes and myocardial infarctions in women than in men. The crossing point for the sexes is between ages 40 and 50. The estimated cost-effectiveness of treating young men is particularly striking, although the data upon which this conclusion is based are less secure than for other age groups. Figure 2 shows how the cost-effectiveness of treatment depends not only on the initial blood-pressure level, but also on the level achieved by treatment. The results are for 40 year olds. For a man whose initial diastolic pressure is 100 mm Hg, the estimated cost-effectiveness value is about $11,000 if his pressure is reduced to 100 mm Hg; and $5,000 if 90 mm Hg is attained.

Results such as these can be used for setting priorities, for initiating treatment and in allocating your time between efforts to achieve blood pressure control in different patients. (Presupposing, of course, that you can be seduced into accepting cost-effectiveness criteria.) Where you will draw the line will depend upon what value you want to assign to a year of life. Figure 2 shows combinations of age and pretreatment DBP according to specific values of the cost-effectiveness ratio. If a criterion of $10,000 per year of life were chosen, one would initiate treatment in a 30-year-old man if his DBP was above 96 mm Hg and in a 30-year-old

woman if it were above 101 mm Hg. Corresponding levels could be selected for a criterion of $15,000 and $6,000.

Thus far, we have assumed full adherence to anti-hypertensive regimens. The well documented failures of patients to adhere to medical regimens, especially long-term ones, can severely compromise the cost-effectiveness as well as the effectiveness of treatment. A patient who continues to use medical resources by visiting his physician and by purchasing medications, but who does not take those medications, imposes a cost without receiving corresponding benefits. The impact on cost-effectiveness depends on whether medications are purchased and not consumed, the worst case, which we call our maximum cost assumption, or whether the patient simply continues to visit the physician but purchases medications only in proportion to their consumption, our minimum cost assumption. Obviously, if a person drops out of treatment he neither receives benefits nor incurs costs. Estimates of the cost-effectiveness of treatment under the assumption of an effective adherence rate of 50 percent, as has been recorded in the literature, are shown in Figure 3. These estimates compare the results of treating mild hypertension with those of treating moderate or severe hypertension for 40 year olds. If treatment were provided for patients with diastolic pressures of 105 mm Hg or above, the average cost per year of increased life expectancy would range from $10,500 under incomplete adherence, if medications are purchased but not taken, to $4,850 under full adherence. Corresponding figures for treating mild hypertension range from $20,400 to $9,900. It is clear that problems with adherence seriously compromise the cost-effectiveness, as well as the effectiveness, of treating hypertension.

These findings have obvious implications for treatment programs. They also should be taken into account, however, when evaluating hypertension screening programs. The failure of newly identified hypertensives to be successfully referred and to receive treatment and, then, to remain under effective long-term care severely detracts from the potential benefits of such programs. Certainly, screening programs should be undertaken only if adequate arrangements and facilities exist such that detected hypertension can be translated into controlled hypertension. Investment in efforts to improve patient adherence may be a much more effective use of resources than widespread public screening.

CONCLUSION

In conclusion, I would like to emphasize four points. First, from data currently available, I cannot say, in any absolute sense, whether treatment of hypertension is a good investment or not. Is $10,000 or $20,000 per year of life saved a good investment? To answer this question, comparisons with alternative uses of health care resources are obviously needed. For example, the cost-effectiveness of treatment for hypertension needs to be compared with that for angina pectoris. Second, standing alone, the results of our analysis can provide certain guidelines for setting priorities within our individual practices. Treatment of higher pressures and younger men should receive the highest priorities. Furthermore, special attention should be given to actually achieving defined goal blood pressures and to improving long-term patient follow-up. Third, analyses such as this suggest ways in which we might contain the costs of our practices while sacrificing little in the way of quality. Judicious choice of laboratory examinations; emphasis on use of generic drugs; and simplification of drug regimens to the maximal extent consistent with achieving blood pressure control are some means to this end. Increased use of nurse practitioners to assume much of the responsibility for the long-term management of hypertensives is another means. The paraprofessional follow-up model is particularly well adapted to industrial clinics as demonstrated so well by Doctor Alderman.

Finally, it is important to stress that our results pertain only to current knowledge and current health practices. As we learn more about the causes of hypertension, preventive measures such as changes in dietary habits or life styles may become possible and may reduce the magnitude of the hypertension problem. Likewise, pharmacological research may lead to more effective and less expensive medications; and the development of alternative therapies, such as biofeedback, may reduce the need for drug treatment. As the characteristics of these developments become known, they can be incorporated into the analysis and their impacts determined.

In the meantime, I hope you will be challenged by this cost-effectiveness approach to evaluating medical care -- challenged to improving upon it and making it more practical to your needs or challenged to discover a better alternative. Above all, I hope you will be challenged to increase your awareness of costs as they apply to your practices.

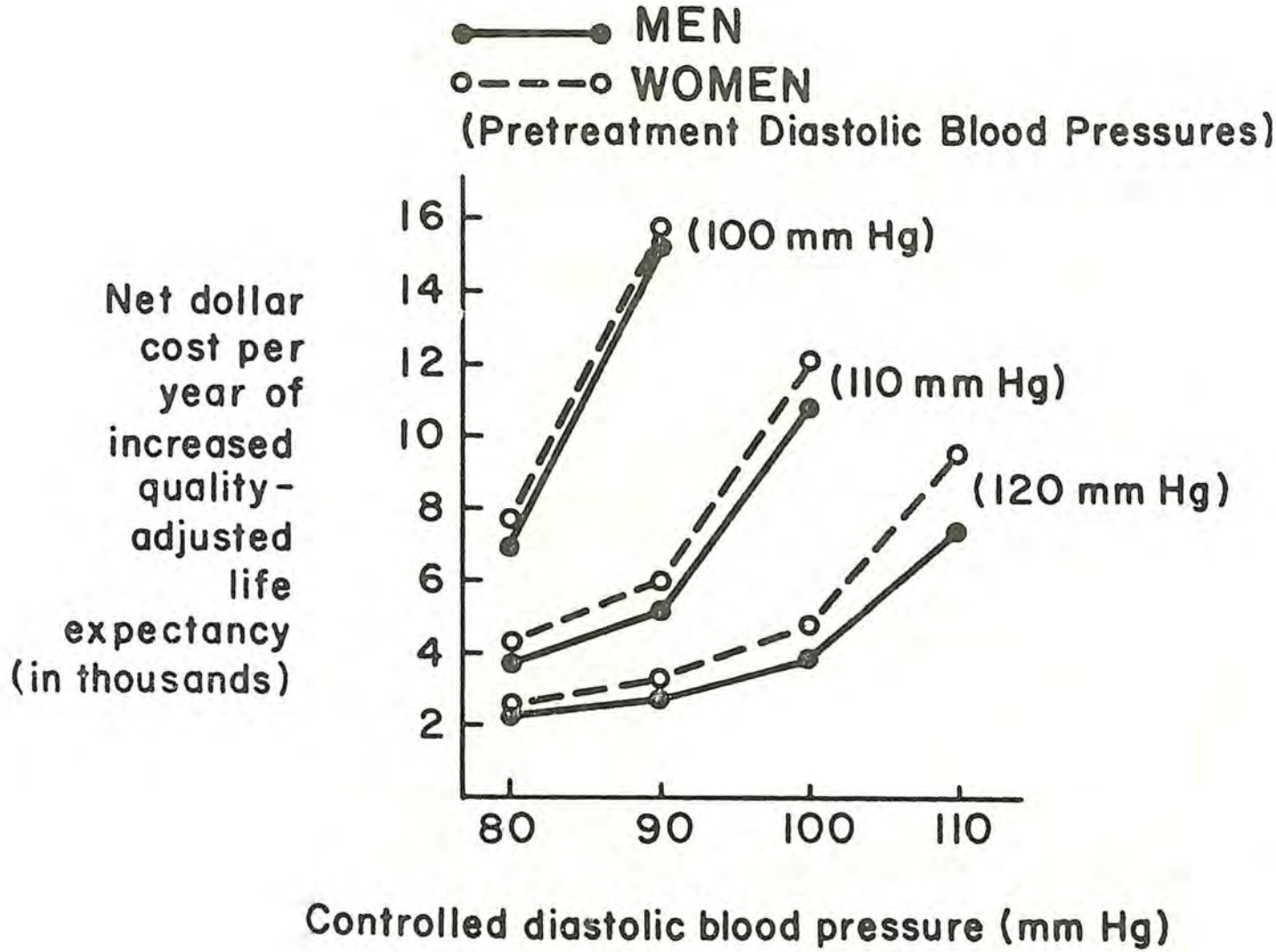

Figure 1. Estimated cost-effectiveness of treating hypertension by sex, age, and pretreatment diastolic blood pressure, and assuming full adherence to therapy.

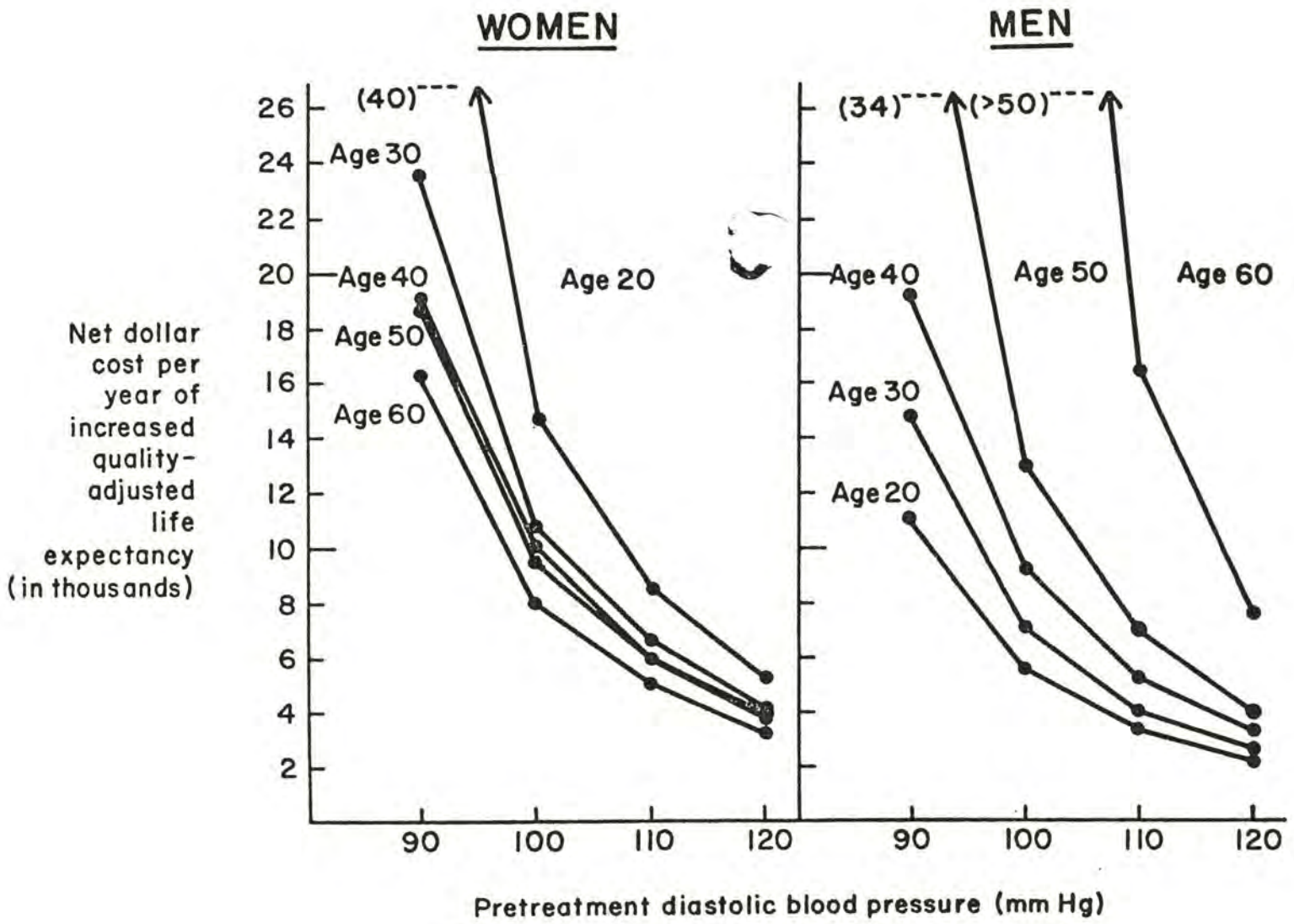

Figure 2. Cost-effectiveness of treatment for hypertension by pretreatment and post-treatment diastolic blood pressure. Results are for 40 year old males and females, assuming full adherence.

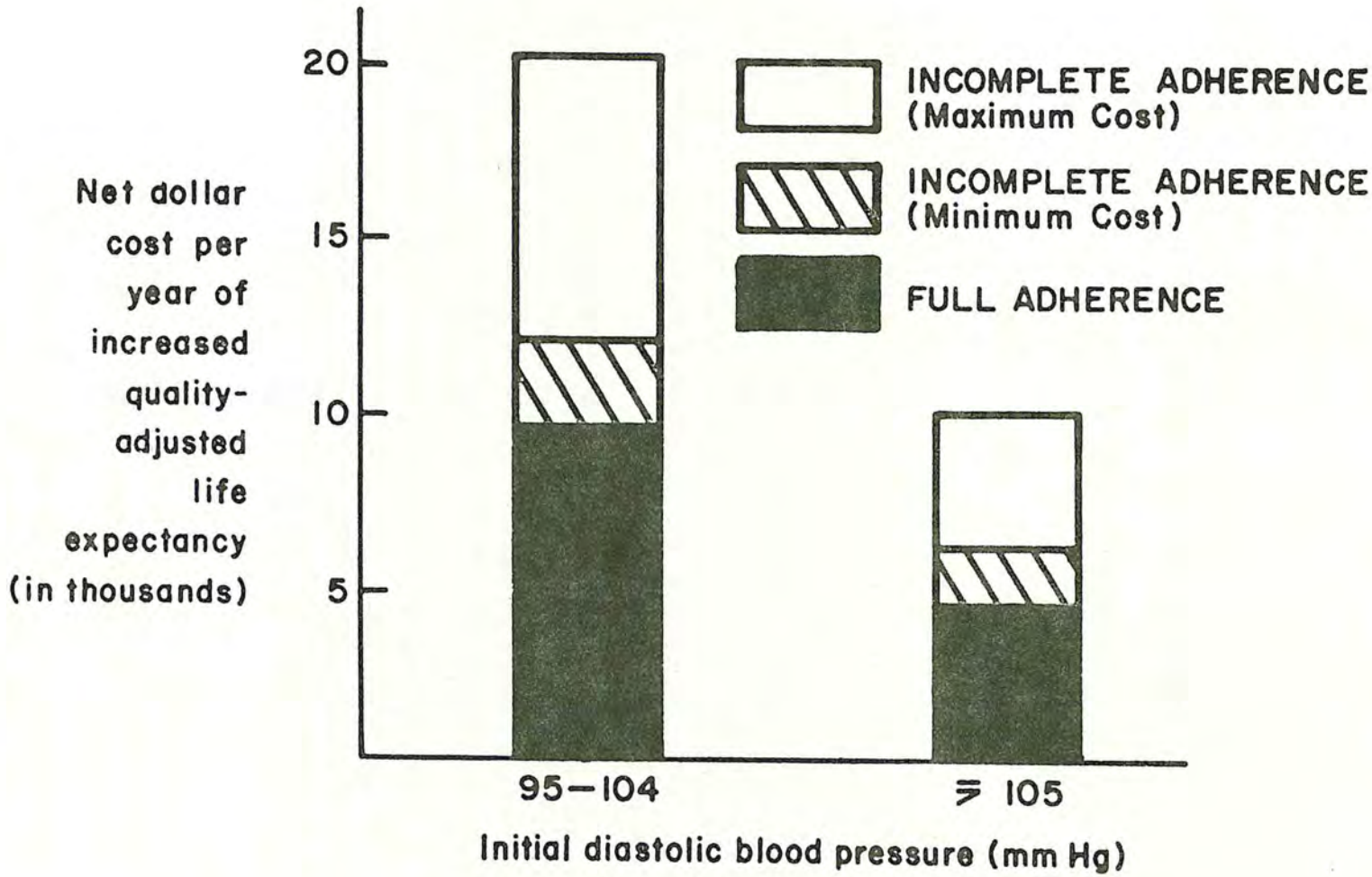

Figure 3. Impact of incomplete adherence and pretreatment blood pressure level on cost-effectiveness of treatment. Results are for 40 year olds.

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NIOSH Project Officer: Loren L. Hatch, DO, PhD
Principal Investigators: Theodore C. Doege, M.D.
Robert H. Wheater, M.S.

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