

Blood Pressure Control To Reduce Cardiovascular Morbidity and Mortality: Today and Tomorrow

Over the past 25 years, age-adjusted rates of death from stroke and coronary heart disease have declined by 60% and 50%, respectively (1). These extraordinary public health achievements have been due, at least in part, to increasingly widespread antihypertensive treatment. The arrival of effective pharmacologic agents in the late 1950s provided the basis for the “disease” or high-risk-oriented approach to reducing blood pressure-associated morbidity by treating patients with the highest blood pressures. In practice, an arbitrary blood pressure threshold was established and repeatedly modified. According to the current threshold of 140/90 mm Hg, 15% to 20% of the adult population can be classified as hypertensive. These patients are the target for drug therapy.

Despite dramatic improvements in mortality rates, cardiovascular disease remains the leading cause of death in the United States. At the same time, some disturbing trends suggest that the current strategy may no longer be up to the task of further reducing morbidity and mortality related to myocardial infarction, stroke, and other vascular disorders. First, the consistent decreases in the rates of death from stroke and myocardial infarction that occurred in the 1970s and 1980s have stalled; in some groups, the trend has actually reversed in the past several years (2). Second, the incidence of myocardial infarction has not declined by nearly the extent to which mortality rates have declined. The rate of end-stage renal disease, which requires dialysis, continues to increase sharply (3). Finally, the incidence of congestive heart failure, already the leading cause of hospitalization for older Americans and a syndrome still associated with a poor prognosis, is escalating at a disturbing rate (4).

Thus, the news is good and bad. Some progress has been made, but much more needs to be done; in addition, some discouraging signs indicate that early successes are not being sustained. I suggest that our challenges and opportunities can be considered in three areas: 1) population-wide blood pressure control; 2) improved identification, treatment, and control of individual patients with hypertension; and 3) risk stratification of treated patients with hypertension to permit appropriate targeting of additional intervention among conventionally treated patients.

Population-Wide Blood Pressure Control

The biology of blood pressure and its relation to morbidity and mortality from cardiovascular disease are not entirely consistent with the present approach of limiting attention to persons whose blood pressure exceeds some arbitrary level. Epidemiologic studies convincingly indicate that blood pressure, both systolic and diastolic, is linearly related to the occurrence of cardiovascular disease throughout the usual range of pressure (5). Clinical trials support the view that, whatever the pressure, a lower one would be better (6). Thus, our current “high-risk” strategy, by design, eliminates all possibility of helping the 80% of the population in whom half of all strokes and myocardial infarctions occur (7). The reduction of the whole population’s blood pressure by just a few mm Hg would produce a greater decrease in cardiovascular morbidity and mortality than could be achieved if 100% of hypertensive patients had their blood pressure controlled (8).

The problem, of course, is that effective tools with which to accomplish this task have eluded us. Weight control, reduced alcohol consumption, exercise, and sodium restriction have all decreased blood pressure in some people. None of these techniques is appropriate for all people, and none has been shown to be feasible in the general population for sustained periods. Although clearly a laudable goal, behavior modification on a population-wide basis is simply not yet possible (9). Limited clinical trials have shown that emphasis on behavioral research designed to develop the tools that improve use of approaches is effective.

Identification, Treatment, and Control of Persons with Hypertension

Awareness, treatment, and rates of control among hypertensive persons in the United States have improved markedly from 1971 to 1991. Disturbing evidence from several cross-sectional studies suggests that the rate of improvement has halted in some areas and may even have been reversed. In any event, the blood pressure of most hypertensive Americans remains uncontrolled. In fact, only about one quarter of all persons with blood pressures greater than 140/90 mm Hg have normalized pressure (10, 11). In view of the increasingly wide attention focused on the problem; the tremendous expansion

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of pharmacologic therapy; and the extensive publicity provided by government, the medical profession, and industry, the persistence of the yawning gap between potential and achievement is disappointing.

The first step is case-finding and initiation of treatment. Screening that is not fully integrated into a treatment program does not work. Detection that is tightly linked to a treatment program does work. At least in principle, “man-

aged care” programs are exactly the type of integrated, responsible health care environment that should make effective case-finding and patient persistence in care feasible. To date, no evidence suggests that accountable managed care organizations have fully exploited the chance to ensure that each enrollee with high blood pressure is even identified, much less brought into effective treatment.

The objective of the exercise, of course, is blood pressure control. Nationwide, treatment is successful in only about half of treated patients. This does not have to be. Many successful programs do achieve patient retention and long-term blood pressure control. For example, participants in clinical trials involving various drugs have repeatedly achieved success (12). Treatment programs specifically designed to meet the needs of patients with this largely asymptomatic but chronic condition have also reported control rates in excess of 75% (13).

The point is that conventional care must be altered to provide effective blood pressure treatment. Characteristics of successful programs include standardized patient-centered treatment strategies, convenience in patient-caregiver interactions, and reliance on an integrated team approach to the delivery of care. Continued dependence on the traditional dyad, in which each patient is viewed in isolation, must be abandoned if the promise of antihypertensive therapy is to be realized.

Risk Stratification for Further Cardioprotective Intervention

Although effective hypertension control reduces the incidence of cardiovascular events by a robust 25% to 30%, more than two thirds of expected events continue to occur even in successfully treated patients. These events are not stochastically distributed among the “recovered” hypertensive population but rather occur according to characteristics that are readily identifiable when treatment begins (7).

On the basis of more than 20 years of follow-up data, my colleagues and I have been able to identify characteristics, readily available at the beginning of treatment, that predict later cardiovascular events (7). In fact, five discriminators (age >55 years; pulse pressure >60 mm Hg; and history of diabetes, myocardial infarction, and stroke) can be used to construct four subgroups with sharply different risks for events. Despite uniform blood pressure control, the 8% to 10% of patients at the highest risk had an annual event rate exceeding 3%, a rate almost 10-fold greater than that in the lowest-risk group (about 30% of patients). The factors found to be predictive in the clinical setting are not, of course, identical to those found in such research trials as the Framingham Study, which described the natural or *unmodified* history of hypertension.

These data suggest that the next step in antihypertensive treatment may be to move beyond one-size-fits-all—the notion that to simply decrease blood pressure to less than 140/90 mm Hg in every patient, by whatever means, is the goal. A set of interventions that is validated, for the most part, in secondary prevention studies might

be applied to patients who meet preconceived absolute levels of risk for cardiovascular disease. Maximum intervention might include all of the tools available for vascular stabilization, such as aspirin; β -blockade; angiotensin II inhibition; reduction of low-density lipoprotein cholesterol levels to less than 100 mg/dL, regardless of total or low-density lipoprotein cholesterol levels; and further reduction of blood pressure to less than 130/80 mm Hg. Control of hyperglycemia, weight, and smoking is more difficult but is probably worth the effort in patients at sufficient risk. Experience in secondary prevention trials suggests that a mix of these interventions might add an additional 30% to 40% to the number of events prevented. Clearly, when the expected annual event rate is 2.5% to 3.5% (the level anticipated for patients with controlled hypertension who are at the highest risk), augmented care that goes beyond simple blood pressure reduction is justified. Although this high-intensity approach is logical, it is based on extrapolation from studies of secondary prevention. Demonstration of effectiveness and cost-effectiveness is still required before this approach can be fully justified.

Conclusions

The success of primary, secondary, and tertiary cardioprotection has been nothing short of a public health triumph. However, as long as cardiac disease and stroke continue to account for so much morbidity and mortality, there is no room for complacency. Plenty of evidence supports the conclusion that more of the same will not be sufficient. We must energize research to produce the tools for universal blood pressure reduction. Meanwhile, the medical world now has the means to improve conventional antihypertensive care. Managed care has a great opportunity that should be exploited. Beyond conventional antihypertensive care are powerful additional tools to marshal in defense of patients who, although "recovered," still remain at high risk for stroke, myocardial infarction, congestive heart failure, or renal failure. This next phase in the grand strategy to contain cardiovascular disease depends on evolving population management strategies that match interventions with expectation of events and, therefore, potential for prevention.

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