Hypertension is the most prevalent health problem among adult primary care patients, but its recognition and treatment are suboptimal. Although there is ample evidence from several large-scale randomized, controlled studies that treatment of hypertension reduces morbidity and mortality, current management of hypertension is characterized by underdiagnosis, misdiagnosis, undertreatment, overtreatment, and misuse of medications. As a result, roughly 75% of the estimated 50 million adults with hypertension in the United States are at increased risk for vascular complications. Optimal therapy requires careful attention to patients’ age, sex, race, diet, exercise, tobacco use, comorbid conditions, choice of antihypertensive drug treatment, compliance with treatment, and achievement of blood pressure control. Other issues that deserve scrutiny are accuracy of the initial diagnosis, self-monitoring of blood pressure, and the advisability of attempting reduction of dosage or possible withdrawal from administration of antihypertensive drug treatment in patients whose blood pressures have been controlled for 1 year or more. Physicians’ knowledge and use of the Sixth Joint National Committee on Prevention, Detection, and Treatment of High Blood Pressure report are deficient. Several responses to this current crisis in care of hypertensive patients are reviewed, including computer-aided management, medical chart audit, academic detailing, and a nurse case manager using prepared algorithms in consultation with the physician.
UNDERUSE

Although pharmacological therapy reduces risks for complications of hypertension (stroke, congestive heart failure, renal failure, and mortality in the younger and older population), both its recognition and treatment are suboptimal. Mortality rates from stroke have declined during the last 25 years, but the rate of decline has slowed. Among the 50 million persons with hypertension in the United States, 68% are aware that their BP is elevated, 53% are receiving treatment, and BP control (<140/90 mm Hg) has been achieved in only 27%. Recent reports indicate decreases in awareness, treatment, and control of BP.

Case Detection

Blood pressure measurement is a routine procedure at each visit in many ambulatory sites, but this practice is not universal. For those sites not offering this routine procedure, it can be instituted with few, if any, additional resources. Major problems for case detection include improper measurement technique and an inadequate number of BP measurements obtained, which are needed to establish the diagnosis before instituting treatment. The result can be either underuse (patients with hypertension who are not identified) or overuse (patients incorrectly labeled as hypertensive).

The JNC-6 recommends at least 2 BP measurements at 2 or more visits to establish a diagnosis, but that number may be inadequate. Of 99 outpatients with elevated BP levels who were followed for 7 months who did not receive antihypertensive drug treatment, 24% were reclassified as normotensive after 4 repeated measurements. Using a trained physician as the reference standard, Stoneking et al found that nursing home staff significantly underestimate systolic BP and overestimate diastolic BP, resulting in misclassification of hypertension in 21% of patients. Body position during measurement is important since both diastolic BP and heart rate are significantly higher while sitting than when supine. Other mistakes in measurements include incorrect arm position. Both systolic and diastolic BP are significantly higher (P<.001) when the arm is on the armrest of a chair than when held at the level of the right atrium. Blood pressure equipment also might be faulty. In a study of 524 aneroid and mercury sphygmomanometers used in both hospital and office settings, 21% to 58% were found to produce inaccurate results. These data and others indicate that many patients with a diagnosis of hypertension might be normotensive and others with true hypertension are not diagnosed. Personnel who measure BP must be trained or retrained in the use of proper technique, instructed to obtain at least the required number of measurements (2 or more at 2 or more visits) for a new diagnosis of hypertension, and taught to examine their equipment for malfunction.

White-Coat Normotension

Patients with office BP measurements in the reference range and elevated ambulatory BPs have been studied. Compared with patients with sustained normotension, they are older and have higher body mass indices, serum creatinine levels, glucose levels, left ventricular mass indices, and carotid wall thickness. Liu et al report a prevalence of “white-coat” normotension of 21% but conclude that the prognosis for these patients is uncertain because there have been no prospective and randomized clinical trials. In a study of 319 healthy individuals, Selenta et al found rates of white-coat normotension of 23% for systolic BP and 24% for diastolic BP. He found few reliable clinical clues that differentiate these patients from those with sustained normotension. He concludes that accurate diagnosis requires ambulatory BP testing. This is a relatively new area of investigation that requires additional research.

Lifestyle Modification

Benefits of salt reduction and, in obese patients, of weight loss to control elevated BP levels have ample documentation. Weight loss of as little as 10 pounds can reduce BP in overweight patients. In a randomized placebo-controlled study of 902 patients with mild hypertension, after 12 months of a nutritional hygienic intervention (intensive intervention focused on enhancing awareness, skills development, behavior change, weight loss, and increased activity), 234 patients assigned to an intervention or placebo group had systolic and diastolic BP reductions of 10.8 mm Hg and 8.1 mm Hg, respectively; BP reductions for groups given the intervention plus antihypertensive monotherapy were even greater. After 4 years of a weight, salt, and alcohol reduction program, 39% of patients with mild hypertension were normotensive without drug therapy. Others have achieved similar dramatic and long-term results. Patients assigned to a diet rich in nuts, vegetables, low-fat dairy foods, and reduced saturated fat, total fat, and cholesterol (DASH Diet) achieved BP reductions even without weight or salt reduction. Addition of an exercise program is needed for both cardiac fitness and weight loss. Kostis et al demonstrated that a reduced-calorie, low-fat diet combined with low-intensity exercise and mental relaxation was superior to propranolol administration in reducing body mass index, total and low-density lipoproteins, and increasing exercise tolerance. There is also evidence that multicomponent individualized cognitive behavioral therapy can reduce BP but none revealing that morbidity or mortality rates are affected. However, these treatment modalities are frequently either ignored or
insufficiently stressed before initiation of antihypertensive medications. Successful weight reduction and adoption of an exercise program, however, are among the most difficult challenges in ambulatory care. Physicians with time constraints in their daily practice likely are not able to spend the requisite time addressing these problems.

Inadequate Antihypertensive Drug Treatment

For optimal risk reduction, it is necessary to achieve the target BP levels advised in JNC-6. Blood pressure control in only 27% of hypertensive patients is unacceptable. This low figure is confirmed in a recent report from the Department of Veterans Affairs clinics study of 800 hypertensive men in which fewer than 25% achieved BPs less than 140/90 mm Hg. It is clear that optimum antihypertensive drug treatment requires close follow-up with slowly instituted changes in dosages of a single antihypertensive drugs or sometimes in the use of 2 or more drugs. Compliance also requires monitoring.

OVERUSE

Two major causes of overuse include (1) continued treatment of patients in whom the diagnosis of hypertension is incorrect and (2) failure to attempt reduction of antihypertensive medication dosage and its possible withdrawal in patients whose BP has been controlled for 1 or more years.

White-Coat Hypertension

The diagnosis of hypertension may be incorrect. In the study by Pickering et al of 292 patients, 21% of untreated patients whose clinic diastolic BP was consistently higher than 90 mm Hg had normal ambulatory BPs. Hoegholm et al found remarkably similar findings in 159 patients with a diagnosis of hypertension in which 24.8% were normotensive as determined by 24-hour ambulatory monitoring. Other studies confirm the high prevalence of white-coat hypertension. Some investigators suggest that white-coat hypertension might not be benign and could cause cardiovascular abnormalities, including stiffness, loss of compliance, and elasticity of cardiac muscle. There is little evidence from longitudinal studies, however, that this group of patients is at an increased risk for cardiovascular morbidity or mortality, but the uncertain prognosis in patients with this finding requires that they receive continued BP monitoring.

Ambulatory and Self-measurement of Blood Pressure

Ambulatory BP testing provides multiple measurements in contrast to only a few from office settings. Correlation between office and ambulatory BP measurements is poor even when measurements from as many as 6 visits are averaged. Ambulatory BP measurements predict cardiac size and function better than office BP determinations. Adjustment of antihypertensive medication using ambulatory BP measurements results in less intensive treatment while maintaining good control of BP and improved well being when compared with adjustments based on office measurements. The JNC-6 suggests that ambulatory monitoring is useful for patients suspected of having white-coat hypertension, those with drug resistance, and those with hypertensive symptoms from antihypertensive medications. They set normal ambulatory BP levels at less than 135/85 mm Hg and sleeping levels at less than 120/75 mm Hg. Cost considerations, however, preclude routine use of ambulatory measurements.

Patients can be taught to measure their own BP at low cost and with good effect. The method is inexpensive, and multiple measurements over extended periods of time can be obtained. These BP data can help distinguish white-coat hypertension from sustained hypertension, help adjust medication dosage, and involve patients in responsibility for their own care. Patient involvement might improve compliance and lower costs by reducing the number of office visits. A study in general practice of 1710 patients found that BP was significantly lower at home than at the office. This difference was independent of age and more marked in women; for systolic BP, P<.001; for diastolic, P<.05.

The Canadian Coalition for High BP Prevention and Control recommends the following:

Self-measured BP readings can be a valuable supplement to clinic (or office) BP measurements. However, self-measurement is appropriate neither for patients who are physically or mentally neither capable of accurate assessment and interpretation of measurements nor for those who do not want to participate. Patients who self-monitor BP require careful training in BP measurement and instruction on the recording and interpretation of BP measurements.

The American Society of Hypertension, New York, NY, Ad Hoc Panel's recommendations for the use of home (self) and ambulatory BP monitoring suggests combining both methods. Treatment should be started on patients with persistently elevated BP levels and evidence of target organ damage. Those without target organ damage should use home monitoring, and if results from home measurements are normal, they should be confirmed by 24-hour ambulatory measurements. If normal measurements are confirmed, monitoring with home measurements should be continued; if findings from ambulatory measurements are elevated, treatment should be started.

Antihypertensive Drug Dose Reduction and Possible Drug Withdrawal

The JNC-6 recommends that step-down therapy of antihypertensive
drug dosages be considered after BP levels have been controlled for at least 1 year and careful follow-up of patients who stop receiving antihypertensive drug treatment. There is considerable evidence to support this recommendation. Froom et al.10 reviewed 12 studies in patients mostly aged 65 years and younger. Combined data from 12 studies80-84 indicate that with 1-year follow-up of 765 patients, successful antihypertensive drug treatment withdrawal was achieved in 308 (40.3%). The rate of success at 2 years decreased to 212 (27.7%). All trials show decreasing success rates over time. The most common predictor of success is lower pretreatment BP levels.82 Other factors reported to be associated with successful withdrawal are female sex,85 lower standing diastolic BP while receiving treatment,54,86 absence of a family history of hypertension,48 ease of control of hypertension with medication treatment,31 and both longer and shorter duration of drug therapy.24,59 In the older population, combined data from 6 studies62-67 gave an average success rate of 26.2% in patients followed for 2 or more years.59 The combined data calculations for successful withdrawal of antihypertensive medications, however, are estimates and should be viewed with caution. Only a few studies used placebo. Heterogeneity between trials in criteria for patient enrollment, length of follow-up, and acceptable postwithdrawal BP levels are major problems for comparisons.68 Adherence to a dietary and exercise program can maximize successful lowering of antihypertensive drug dosage and its possible withdrawal.27-32

**MISUSE**

The major randomized double-blind studies that demonstrate decreases in morbidity and mortality in treated patients used either diuretics or β-blockers.4-10 In the last several years, many new and more expensive antihypertensive drugs have been developed. Some have special properties that make them particularly useful for patients with selected comorbid conditions. For example, angiotensin-converting enzyme inhibitors are preferred for patients with heart failure and diabetes. In contrast, some newer drugs are widely used with little indication that they produce effects superior or equal to older and cheaper drugs. The JNC-6 details suggestions for appropriate use of antihypertensive medications.3 They recommend diuretics and β-blockers as first-line therapy, and unless contraindicated, diuretics are preferred for older patients. Use of calcium-channel blockers as a first-line drug for older patients is controversial. A report from the Systolic Hypertension in Europe Trial149 that compared placebo (n=1180) with calcium-channel blockers (n=1238) found the incidence of dementia was reduced from 7.7 to 3.8 cases per 100 patient-years (21 vs 11 patients; P=.05). Alternately, the Canadian Study of Health and Aging70 found that cognitive decline was significantly more likely in patients using calcium-channel blockers than in those receiving other antihypertensive drugs (75% vs 59%).

Analysis of published antihypertensive trials subsequent to JNC-6 concludes that although calcium-channel blockers and angiotensin-converting enzyme inhibitors might be safe and effective as diuretics and β-blockers, with the exception of coexisting diabetes, they are no more effective or better tolerated.71 Nevertheless, between the years 1992 and 1995, calcium antagonists increased from 33% to 38% of all antihypertensive medications prescribed; for angiotensin-converting enzyme inhibitors, the increase was from 25% to 33%. At the same time, β-blocker use fell from 18% to 11%. The consequence of these therapeutic choices in 1995 dollars was an increase of $72 million dollars in expenditures for drugs.72

**HEALTH CARE DELIVERY FACTORS**

**Physician Time Constraints**

The exponential growth in managed care coverage exerts pressure on practicing physicians to see more patients. In a survey of 768 physicians, 75% report pressure to see more patients, and 24% feel that this pressure compromises patient care.73 Physicians with visit rates of 3.8 per hour perform fewer preventive medicine procedures, record fewer psychosocial issues, and refer more patients to specialists than those who see fewer patients.74 Furthermore, the amount of time spent with a patient relates directly with satisfaction for both physician and patient. “It appears that in the United States visit rates above 3 or 4 per hour are associated with suboptimal visit content.”75

**Adherence to Guidelines**

Adherence to clinical guidelines is poor. Cabana et al.76 describe several barriers to adherence to guidelines that include lack of awareness of their existence, lack of familiarity and agreement with their content, lack of ability to follow the recommendations, lack of expectation that adherence to the recommendation will achieve the desired effect, and the inertia of previous practice. For patients receiving antihypertensive drug treatment, their physician’s knowledge or acceptance of JNC-6 guidelines is poor. Based on a national random sample of 500 office-based primary care internists, family practitioners, and general practitioners, JNC-6 guidelines are not followed when initiating treatment in African American patients, older patients, those with mild renal failure, or in patients with comorbid conditions.77

Several interventions to improve the quality of hypertension care...
have been attempted; unfortunately, most have had little success. One that has been useful, however, is follow-up of newly discovered hypertensive patients at community centers. Improved rates have been demonstrated with enhanced tracking by community health workers.78

Use of computer technology to change physician behavior has been reported. Montgomery and Fahey79 assessed studies of use of computers and computer-based clinical decision support systems for care of ambulatory hypertensive patients. Computer programs were used for a variety of tasks that included case finding, recall and registration, BP control, and prescribing patterns. Among 7 trials that studied different components of patient care, 4 of 5 reported improvement for patient administration; 2 of 3, improvement in physician performance; but only 2 of 6, improvement in BP control. A recent report of a computer-based clinical decision support system using clinical guidelines for hypertension in 17 health centers with 53 physicians and 2014 patients found no statistical differences in physician behavior between the intervention and control groups, although the physicians judged the computer system as not user-friendly.80 Although the method has promise, additional studies are needed. Large-scale implementation of clinically detailed computerized programs to measure performance systems by health care plans, however, is at best 5 to 10 years away.81

Audits with feedback of findings are another technique to improve physician performance. Mashru and Lant82 audited 6 general practices and found posteducational improvement in recordings of body mass index, lipid concentrations, and urea and electrolyte values, but not in better diagnosis or BP control. Bogden et al83 tested the effect of a team of physicians and pharmacists on patients with uncontrolled hypertension. In a randomized, controlled trial on a sample of 95 adult patients with hypertension, more than twice as many patients in the intervention group (55% vs 20%; P<.001) attained BP control compared with the control group. Although this method was effective in an academic setting, it does not seem generalizable to most health care settings.85

Academic detailing and continuous quality care improvement teams have also been proposed to improve compliance with established treatment guidelines. In a randomized controlled trial, Goldberg et al84 tested the effectiveness of academic detailing and continuous quality improvement teams to increase compliance with national guidelines for the primary care of hypertension and depression in 15 small group practices. Continuous quality improvement teams had no effect across all sites for either disease, although their use combined with academic detailing increased the percentage of BP adequately controlled in hypertensive patients by 17.3 percentage points compared with controls (P=.03). The authors conclude that both methods “were generally ineffective in improving guideline compliance and clinical outcomes regarding the primary care of hypertension and depression.”85

A Nurse Case Manager

Of methods proposed to improve quality of hypertension care, perhaps the most attractive and practical is adding a nurse case manager to the primary care team. Almost all patients prefer a primary care physician as their first source for and coordinator of their medical care.85 To facilitate the coordinator role and expand services rendered to patients, a team approach is required. For hypertension care, a nurse case manager, working under supervision of the primary care physician using protocols designed from the JNC-6, might be able to address the current deficiencies in its treatment. Adding a nurse to a primary care site is preferable to referring these patients to specialty hypertensive clinics. Keeping hypertensive patients in the primary care site with their own provider prevents fragmentation of care for their multiple other primary care health problems.86

Optimal management of hypertension as defined in JNC-6 is complex and time consuming. Increasing demands on physicians’ time make delivery of such care more difficult. That nurses who receive advanced instruction can provide these or similar services adequately has been demonstrated in several venues.86,87 Patient satisfaction with nurse-administered care in primary care is excellent.88 Health System Minnesota, Minneapolis, (a vertically integrated health care organization) has initiated a program that includes decentralized care delivery by nurse coordinators for patients with hypertension and others with long-term illness. The report of these activities, however, is preliminary.89 Using a nurse case manager for 138 diabetic patients of whom 72% completed 12 month follow-up, glycosylated hemoglobin was reduced by 1.7% and fasting blood glucose by 2.4 mmol/L (43 mg/dL) compared with controls in which comparable figures were 0.6% and 0.8 mmol/L (15 mg/dL), respectively. Self-reported health status also improved in the intervention group (P=.02).89

Stason et al90 and Shepard et al92 reported experience in 32 Veterans Affairs Hypertension Screening and Treatment Clinics using “specially trained nurses or physician assistants” working under the supervision of a physician. There was wide variation among clinics in costs and clinical outcomes, but better clinical outcomes were associated with more frequent clinic visits, shorter waiting times, more time spent counseling patients, therapists with a single supervisor, and better staff
satisfaction. Training of the therapists and protocols used were not specified.

Compelling evidence of efficacy of nurse-administered brief behavioral counseling comes from a study of 883 patients of British physicians. Brief behavioral counseling, using the stage of change model, led to greater changes in dietary fat intake, regular physical activity, and number of cigarettes smoked than did standard care.

Despite improved care for discrete medical entities by nursing clinics, the model is not optimal for widespread use in the United States. As noted earlier, many patients prefer a primary care physician as their first source of care and to function as their health care coordinator. The high rate of uncontrolled hypertension in the patient population makes referral to specialty clinics an undesirable option.

The problems of underuse, overuse, and misuse that pervade the health care system make immediate attention because roughly 35 million afflicted persons are at increased risk for its complications. This number is a conservative estimate if the optimal BP level is lower than that recommended by JNC-6, or 138/83 mm Hg as demonstrated in the Hypertension Optimal Treatment study. New drugs or technical advances are not required to achieve these goals. Instead, patients with hypertension require increased attention and time from health care providers to address the multiple components of optimal care. The profound changes in the national health care delivery system during recent years have an effect on the quality of care these patients receive. Since it is unlikely that time constraints for primary care physicians will diminish, new and creative interventions are required.

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