

Barriers to and strategies for effective blood pressure control

David Siegel^{1,2}

¹Medical Service, Department of Veterans Affairs, Northern California Health Care System, Mather, CA, USA; ²Department of Medicine, University of California, Davis, CA, USA

Abstract: There are major differences between the current knowledge of the treatment of cardiac conditions derived from evidence-based medicine and the widespread application of this knowledge. This is particularly true in the treatment of hypertension. Hypertension is the most common chronic cardiovascular condition, affecting more than 50 million Americans and approximately 1 billion individuals worldwide. However, many hypertensive patients are not receiving treatment, and of those that are, many are not adequately controlled. There is evidence that there are methods to improve blood pressure control and improve compliance with expert recommendations for the treatment of hypertension. These methods range from local initiatives such as academic detailing to national performance measures as have been developed by the US Department of Veterans Affairs. A challenge for the future will be to identify and broadly apply these and other programs to improve the quality and efficiency of hypertensive treatment.

Keywords: academic detailing, antihypertensives, hypertension, medication prescribing

Over the past 60 years, the treatment of cardiovascular diseases has made revolutionary progress. The development of cardiopulmonary bypass, angioplasty, and the use of lasers are just a few of the technological innovations that are available for the treatment of patients suffering from cardiac disease. Equally impressive are findings from well controlled and executed clinical trials that have established medical treatments for many cardiac conditions. Yet, many of these treatments are underutilized. This has been particularly true for hypertension in many different clinical settings (Goldstein et al 1994; Berlowitz et al 1998; Hyman and Pavlik 2001; Jackson et al 2002).

Blood pressure control

Hypertension is the most common chronic cardiovascular condition, affecting more than 50 million Americans and approximately 1 billion individuals worldwide (NHLBI 2003). The benefits of lowering blood pressure in hypertensive individuals on the morbidity and mortality associated with cardiovascular and renal disease has been established in many randomized controlled trials (SHEP Cooperative Research Group 1991; The ALLHAT 2002; Blood Pressure Lowering Treatment Trialists' Collaboration 2003), including the seminal Department of Veterans Affairs (VA) study published in 1970 (Veterans Administration Cooperative Study Group on Antihypertensive Agents 1970).

However, data from the National Health and Nutrition Survey (NHANES) III indicate that only 46% of men and 65% of women with blood pressure $\geq 140/90$ mmHg are currently receiving antihypertensive treatment in the US (Burt et al 1995). Of those under treatment, only 50% of men and 58% of women are adequately controlled. This includes patients 65 years of age and older as well as younger patients (Glynn et al 1995). Strategies to improve blood pressure control as well as decisions concerning

Correspondence: David Siegel
Medical Service (111), Department of
Veterans Affairs NCHCS, 10535 Hospital
Way, Mather, CA 95655, USA
Tel +1 916 843 7096
Fax +1 916 366 5475
Email david.siegel@med.va.gov

the best pharmacological treatment for these patients will have major morbidity and mortality consequences, as well as important implications for the cost of medical care.

Currently, US national hypertensive treatment is at odds with published guidelines from national bodies. In older studies of different populations and different time periods, there has been an increased use of calcium antagonists and ACE inhibitors, with a parallel decline in the use of thiazide diuretics and β -blockers (Siegel and Lopez 1997). This change in antihypertensive drug use occurred despite recommendations from The Fifth and Sixth Reports of the Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure (JNC V and VI) that hydrochlorothiazide and β -blockers be used as first-choice agents if there are no other specific indications. This is because they have been shown in long-term controlled clinical trials to reduce cardiovascular morbidity and mortality as well as or better than other classes of antihypertensives, and they are far less expensive (JNC 1993, 1997).

The US is not alone in this problem. Studies performed in Canada and the United Kingdom of patients newly treated

for hypertension show variability in the choice of initial medication. ACE inhibitors and calcium antagonists were more commonly prescribed in the Canadian province of Saskatchewan (Bourgalt et al 2001), whereas diuretics or β -blockers accounted for 54% of new prescriptions in Britain (Walley et al 2003). In the US, data from the National Ambulatory Care Medical Surveys of office-based physicians has been used to evaluate antihypertensive treatment from 1980 to 1995 (Nelson and Knapp 2000). Trends in this study included a decrease in diuretic use and an increase in calcium antagonist and ACE inhibitor use. More recently, a study of Maine Medicaid databases for 1994, 1997, and 1999 reported high use of ACE inhibitors and calcium antagonists (Clause and Hamilton 2002).

Barriers to blood pressure control

Why only a small proportion of hypertensives achieve recommended blood pressure reduction targets is likely to be multifactorial including patient belief systems dismissing hypertension as a significant medical problem, lack of consistent medical follow-up, provider failure to adjust drug regimens to achieve control, medication side effects and

Table 1 Impediments to and potential strategies for effective blood pressure control

| Impediments | Possible interventions |
|------------------------------|--|
| <i>Patient-based</i> | |
| Attitudes about hypertension | Education at the community and individual level concerning consequences of hypertension |
| Medication side effects | Use of medications with fewer side effects Education of and treatment for sexual side effects |
| Medication cost | Use of diuretics and other generically available medication |
| Medication adherence | Less frequent dosing of medications Promotion of pillboxes Combination medications Methods to increase ease of medication renewal (ie, telephone or computer-linked) Rewards for higher adherence and lower blood pressure |
| <i>Provider-based</i> | |
| Knowledge | Conferences Academic detailing Computer-based algorithms Publication of clinical trials |
| Access | Use of physician extenders Group visits Work site care Expansion of health coverage |
| Awareness | Computer based reminders |
| Motivation | Incentives for health providers and managers |
| <i>Societal-based</i> | |
| Awareness | Public education campaigns Community-screening programs Work-based programs |
| Access to care | Expansion of health coverage (private and government financed) |

dosing, lack of economic resources to access healthcare or purchase medications, and lack of adherence with medications (Table 1) (Egan and Basile 2003; Nelson et al 2003). Hypertension is also frequently complicated by comorbid conditions which makes its treatment more complicated (Meier et al 1999).

Poor medication adherence is an important problem in the management of hypertension. Patients with hypertension are often asymptomatic. The disease then lacks a tangible reinforcement factor to foster medication adherence in contrast with what may be seen in other chronic conditions such as diabetes where symptoms of hyperglycemia remind the patient about the need to take medications.

The decision to manage the hypertensive patient with medications often results in lifelong therapy. Medications bring along symptoms from side effects enforcing the belief that the cure is worse than the disease. Failure to refill medications as expected occurred in 33% of refill opportunities in one study (Bailey et al 1996). Medication refill patterns have been correlated to blood pressure control and, as would be expected, failure to refill on time corresponds to patients not taking the medication on a regular basis thus losing blood pressure control (Steiner et al 1988).

Barriers to effective prescribing practices

The prescribing of medication is a complex phenomenon. It is assumed that the skills needed to prescribe medication are acquired during medical training and are sustained during clinical practice by effective continuing medical education (CME). It is hypothesized that scientifically based prescribing patterns are based, at least in part, on the publication, interpretation, and application of results from scientifically sound clinical trials, attendance at CME meetings, or recommendations from expert medical organizations or panels that are then applied to the care of individual patients. There is much evidence that these assumptions are incorrect for the treatment of many cardiovascular conditions including hypertension. There are medical treatments of proven morbidity and mortality benefit for congestive heart failure, atrial fibrillation, dyslipidemias, hypertension, and for patients after myocardial infarction. Current evidence including that cited above indicates that these treatments are underutilized resulting in premature morbidity and mortality (Siegel 2000; Amsterdam et al 2002).

Why might this be the case? It is unlikely that differences of opinion based on different interpretations of scientific evidence are the primary basis for widespread differences in the use of medications. The use of calcium antagonists for the various manifestations of cardiovascular disease is not only of unproven mortality benefit (Conti 1996), but findings from retrospective noninterventional studies raise concerns that short-acting calcium antagonists are associated with serious adverse effects in hypertensive patients and thus should be avoided except in rare circumstances (Buring et al 1995; Psaty et al 1995). Despite this controversy played out in medical journals and at national meetings, most practitioners from around the world, including the US, were unaware of the calcium antagonist debate, despite widespread media coverage (Hobbs 1997).

In the case of hypertension, expert recommendations may have had little impact on antihypertensive prescribing patterns because of the lack of successful dissemination of these recommendations, the effectiveness of pharmaceutical promotion practices, or the attractiveness of using new therapies so that practitioners are considered up-to-date. Of these, the role of pharmaceutical promotion practices, including face-to-face sales activities and pharmaceutical advertisements, has probably had the greatest impact (Soumerai 1988; Soumerai et al 1989; Wilkes et al 1992). Misinformation about the role of drugs may stem from inaccurate drug advertisements and inaccurate statements made by pharmaceutical representatives (Wilkes et al 1992; Ziegler et al 1995). These intense promotional efforts of pharmaceutical companies to influence prescribing patterns for financial reasons may result in the prescribing of medications that are inferior or at best equivalent to other treatments. The end result is that medication use often differs from well developed clinical practice guidelines that are usually based on the best available evidence from clinical trials.

Strategies to improve medication use

What can be done to improve patterns of medication use (Table 1)? One approach would be to improve how guidelines are formatted, organized, and disseminated (Lenfant 1997), although this is unlikely to have a major impact. A review of 99 studies of methods to change physicians' practice concluded that educational materials alone and formal CME conferences or activities, without enabling or practice-reinforcing strategies, had relatively

little impact (Davis et al 1995). The most commonly effective single-method interventions were outreach visits, including academic detailing, patient reminders and educational materials, and physician reminders.

Academic detailing, originally developed in the early 1980s, was termed counter-detailing to indicate the promotion of drug use and to counter the pharmaceutical industry's overpromotion of other drugs (Soumerai 1988; Soumerai et al 1989). It uses the pharmaceutical industry method of drug detailing to promote an institution's desired use of drugs or other elements of patient care, and involves face-to-face meetings of providers with typically a pharmacist or another healthcare provider. At the meeting, often of just a few minutes duration, the detailer explains the specific area of promotion and leaves written materials as reference. While not extensively studied, research suggests that academic detailing is a useful way to improve prescribing practices and to successfully implement practice guidelines (Davis et al 1995; Barreuther 1997).

In a recent VA study, academic detailers met with providers to discuss their past prescribing of anti-hypertensive medications and to suggest changes that would bring their practice more into compliance with JNC VI guidelines (Siegel et al 2003). Over the initial six-month period following the first meeting, thiazide diuretic use increased by 20% and calcium channel blocker use decreased by 11%.

Different approaches to the prescribing of medication might improve patient adherence. Changes in dosing schedules have been tried. In one study, enalapril once daily compared with twice daily resulted in no differences in treatment outcomes (Girvin et al 1999). Combination therapy might simplify dosing schedules but usually at the expense of increased costs.

Other approaches may result in improvement of care. Change in practice-wide systems may improve medication prescribing as well as other healthcare practices (Pearson et al 1996). These include disease state or case management, the use of information systems to prompt treatment of appropriate patients, and other quality improvement strategies. Appropriate public education campaigns may also be useful as well as other interventions aimed at the patient. This appears particularly important given the large number of hypertensives that remain untreated (Burt et al 1995). All of these approaches require further study to determine which are the most effective.

Other efforts to improve hypertensive treatment in the US Department of Veterans Affairs

Approximately 40% of VA patients have hypertension due, in part, to its older population (Meier et al 1999). Consequently, medications used to control hypertension are used extensively in VA. To address the large hypertensive disease burden on the healthcare system, VA has developed and promoted hypertension management guidelines that closely resemble JNC VI (Department of Veterans Affairs Medical Advisory Panel 1996). This has been part of a program to improve clinical outcomes via quality improvement initiatives. National performance measures starting in the late 1990s tracked the proportion of patients achieving target blood pressure and set increasing targets for the proportion of patients that should be at their goal. Perhaps partly due to these performance measures, data from a study of quality indicators demonstrated that VA outperforms private-sector US healthcare systems (Jha et al 2003). VA antihypertensive medication utilization trends for 1997–1999 suggested a downward trend in calcium antagonist use and an increase in β -blocker and thiazide diuretic use (Siegel et al 1998, 2001).

This continued shift from calcium antagonists to β -blockers and diuretics plus the large use of ACE inhibitors indicate greater adherence to treatment guidelines. Emphasis on evidence-based medicine together with the publication of clinical trials suggesting a lack of benefit for calcium antagonist use and safety concerns such as gastrointestinal bleeding or cancer may have had an impact on medical practice regarding this antihypertensive drug class (Psaty et al 1995; Pahor, Guralnik, Furberg, et al 1996; Pahor, Guralnik, Salive, et al 1996). However, in accord with recent data on VA's quality, we feel the strongest agent for change in hypertension management and for the shift in medication use patterns are VA's performance measures (Jha et al 2003). These measures grade a VA, develop accountability, and may have institutional financial incentives associated with meeting targets. This managerial approach to improving care has the net effect of engaging clinical managers, who sign performance contracts, and practitioners toward achieving specific measurable goals. This approach has resulted in improved hypertension control while producing savings in drug expenditures. The use of performance measurement as a way to improve quality in VA has, at least in part, increased the number of VA hypertensive patients with blood

pressures of less than 140/90 mmHg from a baseline of 25% in 1994–1995 to 46% in 2000 (Jha et al 2003). Although not in place long enough to be evaluated by Jha et al (2003), the use of clinical reminders generated by the VA electronic medical record may have additional benefits for blood pressure control.

Conclusions

The need for physicians to remain up-to-date regarding improvements in medication use, procedures, and diagnostics is obviously important. Yet, there is a serious gap between current knowledge of the treatment of cardiac conditions derived from evidence-based medicine and the widespread application of this knowledge. Evidence from VA suggests that there are methods to improve the prescribing of medication, including academic detailing and the promotion of system-wide performance measures. It is not known if changes in antihypertensive medication use in VA are also occurring in non-VA settings. However, it appears that thiazide diuretics continue to be underutilized in hypertensive treatment. The recent publication of results from The Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial (ALLHAT), which noted that thiazide diuretics were superior to calcium antagonists and ACE inhibitors in several areas, underscores this concern (The ALLHAT 2002). ALLHAT study findings, now incorporated into the JNC-7 guidelines, focus the therapy of uncomplicated hypertension on thiazide diuretics (Chobanian et al 2003). Hopefully, lessons learned from the successful reengineering of the VA healthcare system will lead to a more widespread adherence to these and similar guidelines.

The views expressed in the article do not necessarily represent the views of the Department of Veterans Affairs or of the United States Government.

References

- Amsterdam EA, Laslett L, Diercks D, et al. 2002. Reducing the knowledge-practice gap in the management of patients with cardiovascular disease. *Prev Cardiol*, 5:12–15.
- Bailey JE, Lee MD, Somes GW, et al. 1996. Risk factors for antihypertensive medication refill failure by patients under Medicaid managed care. *Clin Ther*, 18:1252–62.
- Barreuther A. 1997. Academic detailing to influence prescribing. *J Manag Care Pharm*, 3:631–8.
- Berlowitz DR, Ash A, Hickey EC, et al. 1998. Inadequate management of blood pressure in a hypertensive population. *N Engl J Med*, 339:1957–63.
- Blood Pressure Lowering Treatment Trialists' Collaboration. 2003. Effects of different blood-pressure-lowering regimens on major cardiovascular events; results of prospectively-designed overviews of randomized trials. *Lancet*, 362:1527–35.
- Bourgalt C, Rainville B, Suissa S. 2001. Antihypertensive drug therapy in Saskatchewan: patterns of use and determinants in hypertension. *Arch Int Med*, 161:1873–9.
- Buring JE, Glynn RJ, Hennekens CH. 1995. Calcium channel blockers and myocardial infarction: a hypothesis formulated but not yet tested. *JAMA*, 274:654–5.
- Burt VL, Whelton P, Roccella EJ, et al. 1995. Prevalence of hypertension in the US adult population: results from the Third National Health and Nutrition Examination Survey, 1988–1991. *Hypertension*, 25:305–13.
- Chobanian AV, Bakris GL, Black HR, et al. 2003. The seventh report of the Joint National Committee on prevention, detection, evaluation, and treatment of high blood pressure: the JNC 7 report. *JAMA*, 289:2560–72.
- Clause SL, Hamilton RA. 2002. Medicaid prescriber compliance with Joint National Committee VI hypertension treatment guidelines. *Ann Pharmacother*, 36:1505–11.
- Conti CR. 1996. Re-examining the clinical safety and roles of calcium antagonists in cardiovascular medicine. *Am J Cardiol*, 78(Suppl 9A):13–18.
- Davis DA, Thomson MA, Oxman AD, et al. 1995. Changing physician performance: a systematic review of the effect of continuing medical education strategies. *JAMA*, 274:700–5.
- Department of Veterans Affairs Medical Advisory Panel. 1996. Pharmacologic management of hypertension. Publication nr 96-0003. Department of Veterans Affairs: Washington.
- Egan BM, Basile JN. 2003. Controlling blood pressure in 50% of all hypertensive patients: an achievable goal in the healthy people 2010 report? *J Invest Med*, 51:373–85.
- Girvin B, McDermott BJ, Johnston D. 1999. A comparison of enalapril 20 mg once daily vs 10 mg twice daily in terms of blood pressure lowering and patient compliance. *J Hypertens*, 17:1627–31.
- Glynn RJ, Brock DB, Harris T, et al. 1995. Use of antihypertensive drugs and trends in blood pressure in the elderly. *Arch Intern Med*, 155:1855–60.
- Goldstein AO, Carey TS, Levis D, et al. 1994. Variations in hypertension control in indigent rural primary care clinics in North Carolina. *Arch Fam Med*, 3:514–19.
- Hobbs FDR. 1997. Is the calcium antagonist debate having an effect on clinical practice? *Am J Cardiol*, 79(10A):20–3.
- Hyman DJ, Pavilk VN. 2001. Characteristics of patients with uncontrolled hypertension in the United States. *N Engl J Med*, 345:479–86.
- Jackson JH, Bramley TJ, Chiang TH, et al. 2002. Determinants of uncontrolled hypertension in an African-American population. *Ethn Dis*, 12:53–7.
- Jha AK, Perlin JB, Kizer KW, et al. 2003. Effect of the transformation of the Veterans Affairs health care system on the quality of care. *N Engl J Med*, 348:2218–27.
- [JNC] Joint National Committee on the Detection, Evaluation, and Treatment of High Blood Pressure. 1993. The fifth report of the Joint National Committee on detection, evaluation, and treatment of high blood pressure (JNC V). *Arch Intern Med*, 153:154–83.
- [JNC] Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. 1997. The sixth report of the Joint National Committee on prevention, detection, evaluation, and treatment of high blood pressure. *Arch Intern Med*, 157:2413–44.
- Lenfant C. 1997. JNC guidelines is the message getting through? *JAMA*, 278:1178–9.
- Meier J, Lopez J, Siegel D. 1999. Prevalence and treatment of hypertension complicated by comorbid conditions. *J Clin Hypertens*, 1:209–11.

- Nelson CR, Knapp DA. 2000. Trends in antihypertensive drug therapy of ambulatory patients by US office-based physicians. *Hypertension*, 36:600–3.
- Nelson MR, Reid CM, Krum H, et al. 2003. Factors influencing family physician adherence to hypertension treatment guideline recommendations on the initiation of pharmacotherapy: questionnaire survey. *Am J Cardiovasc Drugs*, 3:437–41.
- [NHLBI] National Heart, Lung, and Blood Institute. 2003. National High Blood Pressure Education Program [online]. Accessed 9 Mar 2004. <http://www.nhlbi.nih.gov/about/nhbpep/index.htm>.
- Pahor M, Guralnik JM, Furberg CD, et al. 1996. Risk of gastrointestinal haemorrhage with calcium antagonists in hypertensive persons over 67 years old. *Lancet*, 347:1061–5.
- Pahor M, Guralnik JM, Salive ME, et al. 1996. Do calcium channel blockers increase the risk of cancer? *Am J Hypertens*, 9:695–9.
- Pearson TA, McBride PE, Miller NH, et al. 1996. Organization of preventive cardiology service. *JACC*, 27:1039–47.
- Psaty BM, Heckbert SR, Koepsell TD, et al. 1995. The risk of myocardial infarction associated with antihypertensive drug therapies. *JAMA*, 274:620–5.
- SHEP Cooperative Research Group. 1991. Prevention of stroke by antihypertensive drug treatment in older persons with isolated systolic hypertension. Final results of the Systolic Hypertension in the Elderly Program (SHEP). *JAMA*, 265:3255–64.
- Siegel D. 2000. The gap between knowledge and practice in the treatment and prevention of cardiovascular disease. *Prev Cardiol*, 3:167–71.
- Siegel D, Lopez J. 1997. Trends in antihypertensive drug use in the United States: do the JNC V recommendations affect prescribing. *JAMA*, 278:1745–8.
- Siegel D, Lopez JR, Meier JL. 1998. Pharmacologic treatment of hypertension in the department of Veterans Affairs during 1995 and 1996. *Am J Hypertens*, 11:1271–8.
- Siegel D, Lopez J, Meier J, et al. 2001. Changes in the pharmacologic treatment of hypertension in the department of Veterans Affairs 1997–1999: decreased use of calcium antagonists and increased use of β -blockers and thiazide diuretics. *Am J Hypertens*, 14:957–62.
- Siegel D, Lopez J, Meier J, et al. 2003. Academic detailing to improve antihypertensive prescribing patterns. *Am J Hypertens*, 16:508–11.
- Soumerai SB. 1988. Factors influencing prescribing. *Aust J Hosp Pharm*, 18(Suppl):9–16.
- Soumerai SB, McLaughlin TJ, Avorn J. 1989. Improving drug prescribing in primary care: a critical analysis of the experimental literature. *Milbank Q*, 67:268–317.
- Steiner JF, Koepsell TD, Fihn SD, et al. 1988. A general method of compliance assessment using centralized pharmacy records. *Med Care*, 26:814–23.
- The ALLHAT Offices and Coordinators for the ALLHAT Collaborative Research Group. 2002. Major outcomes in high-risk hypertensive patients randomized to angiotensin-converting enzyme inhibitor or calcium channel blocker vs diuretic; the Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial (ALLHAT). *JAMA*, 288:2981–97.
- Veterans Administration Cooperative Study Group on Antihypertensive Agents. 1970. Effect of treatment on morbidity in hypertension. II. Results in patients with diastolic blood pressures averaging 90 through 114 mmHg. *JAMA*, 213:1143–52.
- Walley T, Duggan AK, Haycox AR, et al. 2003. Treatment for newly diagnosed hypertension: patterns of prescribing and antihypertensive effectiveness in the UK. *J R Soc Med*, 96:525–31.
- Wilkes MS, Doblin BH, Shapiro MF. 1992. Pharmaceutical advertisements in leading medical journals: experts' assessments. *Ann Intern Med*, 116:912–19.
- Ziegler MG, Lew P, Singer BC. 1995. The accuracy of drug information from pharmaceutical sales representatives. *JAMA*, 273:1296–8.