

# How Well Have Practices Followed Guidelines in Prescribing Antihypertensive Drugs: The Role of Health Insurance

Jennifer D. Guo, Gordon G. Liu, Dale B. Christensen, PhD, Alex Z. Fu

Pharmaceutical Policy and Evaluative Sciences, University of North Carolina at Chapel Hill, Chapel Hill, NC, USA

## ABSTRACT

**Background:** The US Joint National Committee (JNC) on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure issues guidelines on the optimal first-line drug therapy in treating hypertension. Despite broad dissemination of these guidelines, prescribing practices have long remained discrepant with recommendations. The purpose of this study was to examine the role of insurance type in the selection of drugs for hypertension treatment in light of the JNC guidelines.

**Methods:** Subjects were derived from the 1996 Medical Expenditures Panel Survey who had a diagnosis of essential hypertension and who were prescribed a diuretic, beta-blocker, calcium channel blocker (CCB), or ACE inhibitor (ACEI) as monotherapy. Using the nationally representative sample, this study presents the first estimates of the impact of insurance policies on the choice of antihypertensive drugs while controlling for predisposing, enabling, and need variables in the context of a logistic health-care utilization model.

**Results:** Nationally in 1996, more than twice as many subjects (7.3 million) were taking ACEIs or CCBs compared to diuretics or beta-blockers (3.1 million) as the first-line drug therapy, a sharp contrast to the JNC guidelines. Patients with health maintenance organization

(HMO) insurance were much less likely than fee for service (FFS) patients to follow the JNC guidelines in this respect (odds ratio 0.50,  $P < .01$ ), controlling for all other factors. Individuals with all other public insurance and no insurance were not statistically different from the FFS group in the use of the study drugs. Other significant factors in the regression model were being of African American descent, being unmarried, having higher out-of-pocket payment, being in excellent physical health, having diabetes, and being diagnosed with essential hypertension after 1988. Each was associated with a decreased likelihood of following the JNC recommendations for the use of diuretics or beta-blockers.

**Conclusions:** After controlling for other predisposing, enabling, and need variables, patients who had HMO coverage were significantly more likely than FFS patients to receive ACEIs or CCBs. Given a popular public perception of HMOs being most cost conscious in providing health care, further research is needed to understand why prescribing patterns associated with HMOs have poorly followed the JNC recommendations.

**Keywords:** hypertension, antihypertensives, insurance, guidelines.

## Introduction

Hypertension is associated with increased risk of stroke, myocardial infarction, atrial fibrillation, heart failure, peripheral vascular disease, and renal disease [1,2]. Hypertension has become a major public health threat to Americans, both medically and economically. About 50 million Americans, or 25% of American adults, have high blood pressure [3]. The total cost of antihypertensive treatment was estimated to be as high as \$40 billion in the

United States in 1999. The indirect cost of hypertension is even more striking, including the cost of increased mortality and morbidity from coronary heart disease, stroke, and congestive heart failure that occurs in untreated or undertreated hypertensive patients.

Drug therapy has played a key role in hypertension control and treatment, with six major classes of antihypertensive drugs available: diuretics, beta-blockers, calcium channel blockers (CCBs), angiotensin-converting enzyme inhibitors (ACEIs), adrenergic inhibitors, and angiotensin II receptor blockers [4,5]. In the United States, the Joint National Committee (JNC) on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure issues a consensus review report every four

*Address correspondence to:* Dale B. Christensen, Pharmaceutical Policy and Evaluative Sciences, University of North Carolina at Chapel Hill, Beard Hall 205E, Chapel Hill, NC 27599-7360. E-mail: dale\_christense@unc.edu

**Table 1** The history of JNC recommendations for hypertension

JNC	Recommendation	Reason
I (1977)	Diuretics	Established the efficacy of diuretics for hypertension in 1970s.
II (1980)	Diuretics	Same as above.
III (1984)	Diuretics and beta-blockers	Established efficacy of both for hypertension.
IV (1988)	Diuretics, beta-blockers, ACEIs, and CCBs	ACEIs and CCBs : new drugs in 1980s. established efficacy some concerns about the safety of diuretic therapy and the side effects of diuretics and beta-blockers.
V (1993)	Diuretics and beta-blockers	Only diuretics and beta-blockers have been shown to reduce mortality and morbidity.
VI (1997)	Diuretics and beta-blockers	Same as above.

to five years that includes stepped therapy guidelines for clinicians in the management and treatment of hypertension. The report, based on the most current clinical evidence at the time, has become a respected standard for the initial evaluation and treatment of hypertension. The history of JNC recommendations for hypertension is presented in Table 1.

Since 1977, the JNC reports have consistently recommended diuretics, and since 1984, diuretics or beta-blockers as the first-line drug treatment for uncomplicated hypertension [4,6–10]. Beginning in the early 1980s, when ACEIs and CCBs became available, these two drugs quickly became widely used antihypertensive agents, coupled with diuretics and beta-blockers. Based on the available evidence on similarities in short-term clinical efficacy, the 1988 JNC Report IV added both ACEIs and CCBs to diuretics and beta-blockers to its recommended list of first line therapy drugs [9].

In the 1990s, several studies were carried out that indicated an association of diuretics and beta-blockers with a decreased risk of cardiovascular morbidity and mortality in clinical trials [11–15]. For example, a prospective, randomized, and double-blind intervention by Dahlof et al. [13] demonstrated a significant effect of three beta-blockers (atenolol, pindolol, and metoprolol) and two diuretics (hydrochlorothiazide and amiloride) on the reduction of stroke mortality and morbidity among a Swedish population cohort aged 70–84 years, compared to placebo. The Systolic Hypertension in the Elderly Program [11] study demonstrated that the 5-year total incidence of stroke was 5.2 per 100 participants in treatment group with diuretics and beta-blockers compared to 8.2 per 100 for the placebo group, with a relative risk of 0.64 ( $P = .0003$ ).

A meta-analysis of by Psaty and colleagues [15] of 18 long-term randomized trials also showed that diuretics and beta-blockers were more effective compared to the placebo, for major disease end points including the incidence of stroke and con-

gestive heart failure, as well as coronary disease and total mortality. In contrast, there was little clinical trial evidence available indicating comparable long-term outcome effect of ACEIs and CCBs [16]. As a result, the following JNC guidelines in 1993 and 1997 recommended only diuretics and beta-blockers as the first-line therapy [4,10]. More recently reported trials (since JNC VI) offer affirmative evidence that diuretics and beta-blockers are at least as effective in reducing overall morbidity/mortality as other agents [17].

In addition, cost data also favored diuretics and beta-blockers over ACEIs and CCBs. A cost-minimization study by Pearce et al. [18] documented that the cost of medication treatment was much lower with diuretics or beta-blockers than with ACEIs or CCBs. Furthermore, Edelson and colleagues [19] estimated the cost-effectiveness of various initial monotherapies for mild to moderate hypertension for 20 years (1990–2010). Using the Coronary Heart Disease Policy Model, they found that the dollar cost per year of life saved was higher for an ACEI (captopril) and a CCB (nifedipine) than for a diuretic (hydrochlorothiazide) or beta-blocker (propranolol). More specifically, their simulation indicated that the cost per year of life saved was \$72,100 for captopril (ACEI) and \$31,600 for nifedipine (CCB), compared to \$16,400 for hydrochlorothiazide and \$10,900 for propranolol hydrochloride.

Despite the consistent JNC recommendations and cost advantages of diuretics and beta-blockers, medical practices in the United States have remained a sharp contrast [20–22]. For example, in the most recent study of antihypertensive drugs in retail channels in the United States, the book by Kaplan and Lieberman [5] showed a sustained trend of increased use of ACEIs and CCBs ever since 1986. In the meantime, the use of diuretics and beta-blockers continued to decrease. Beginning in the early 1990s, the total number of prescriptions for CCBs and ACEIs exceeded the number of prescriptions for beta-blockers.

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