

Contemporary practice patterns in the management of newly diagnosed hypertension

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Abstract

Objective: To determine what proportion of patients with hypertension are managed in accordance with guidelines established by the Canadian Hypertension Society.

Design: Retrospective medical record review.

Setting: Outpatients seen in primary care offices and internal medicine referral clinics in Edmonton.

Patients: All 969 adults who presented with a new diagnosis of essential hypertension from Sept. 1, 1993, to Dec. 31, 1995.

Outcome measures: Initial laboratory tests performed, advice concerning nonpharmacologic treatment given, antihypertensive drugs prescribed and any contraindications to thiazide diuretics or β -adrenergic blocking agents documented.

Results: The mean age of the 969 patients in the sample was 52.5 years; 129 (13%) of the patients were older than 70 years of age; and 500 (52%) were women. Most of the patients (704, 73%) had mild or moderate diastolic hypertension. In the 617 patients who underwent laboratory tests related to hypertension, the creatinine level was determined in 466 (76%), the cholesterol level in 372 (60%), a urinalysis was conducted in 378 (61%), the serum potassium level was checked in 343 (56%), the sodium level in 323 (52%) and an electrocardiogram was performed in 303 (49%). Liver function tests, which are not recommended in the guidelines, were performed in 338 patients (55%). Although there were differences in prescribing among physicians in the 711 patients given first-line therapy, most (238, 34%) were prescribed angiotensin-converting-enzyme (ACE) inhibitors. Lifestyle modification, without drug therapy, was suggested for 180 (25%) of the patients. Although the guidelines recommend their use for first-line drug therapy, only 82 patients (12%) were given β -adrenergic blocking agents and only 75 (11%) were given thiazide diuretics. Of the patients who were prescribed an antihypertensive other than a thiazide or β -adrenergic blocking agent as first-line drug therapy, only 161 (43%) had a documented contraindication to thiazides or β -adrenergic blocking agents.

Conclusions: There is variation in the contemporary care of patients with hypertension. Further studies are required to determine the reasons underlying physicians' noncompliance with the evidence-based guidelines established by the Canadian Hypertension Society.

Résumé

Objectif : Déterminer la proportion des patients souffrant d'hypertension qui sont traités conformément aux lignes directrices établies par la Société canadienne d'hypertension artérielle.

Conception : Examen rétrospectif des dossiers médicaux.

Contexte : Patients en consultation externe reçus dans des cabinets de soins primaires et des cliniques de présentation en médecine interne d'Edmonton.

Patients : Les 969 adultes chez qui on a posé pour la première fois un diagnostic d'hypertension essentielle entre le 1^{er} sept. 1993 et le 31 déc. 1995.



Evidence

Études

From the Divisions of
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Mesures des résultats : Premiers tests de laboratoire effectués, conseils donnés sur le traitement non pharmacologique, antihypertenseurs prescrits et toute contre-indication documentée au sujet des diurétiques au thiazide ou aux β -bloquants.

Résultats : Les 969 patients de l'échantillon avaient en moyenne 52,5 ans; 129 (13 %) avaient plus de 70 ans et 500 (52 %) étaient des femmes. La plupart des patients (704, 73 %) avaient une hypertension diastolique bénigne ou moyenne. Parmi les 617 patients qui se sont soumis à des tests de laboratoire portant sur l'hypertension, on a établi le taux de créatinine chez 466 (76 %) d'entre eux et le taux de cholestérol chez 372 (60 %); on a effectué une analyse d'urine chez 378 (61 %) d'entre eux, établi le taux de potassium sérique chez 343 (56 %), le taux de sodium chez 323 (52 %), et 303 (49 %) ont été soumis à un électrocardiogramme. On a procédé à des tests de fonction hépatique, qui ne sont pas recommandés dans les lignes directrices, chez 338 patients (55 %). Même s'il y avait des différences entre les ordonnances des médecins chez les 711 patients qui ont reçu un traitement de première intention, la plupart (238, 34 %) sont vu prescrire des inhibiteurs de l'enzyme de conversion de l'angiotensine (ECA). On a suggéré à 180 (25 %) des patients de modifier leur mode de vie sans leur prescrire de pharmacothérapie. Même si les lignes directrices les recommandent pour la pharmacothérapie de première intention, 82 patients (12 %) seulement ont reçu des β -bloquants et 75 (11 %) seulement ont reçu des diurétiques au thiazide. Parmi les patients auxquels on a prescrit un hypotenseur autre qu'un thiazide ou un β -bloquant comme pharmacothérapie de première intention, 161 (43 %) seulement avaient une contre-indication documentée au thiazide ou aux β -bloquants.

Conclusions : Les soins modernes des patients souffrant d'hypertension varient. Des études plus poussées s'imposent si l'on veut déterminer pourquoi les médecins ne se conforment pas aux lignes directrices fondées sur des données probantes établies par la Société canadienne d'hypertension artérielle.

Despite an increasing emphasis on evidence-based medicine, health outcome research continues to show that there are significant variations in the care of patients with common conditions.^{1,2} For example, physician surveys and practice audits have shown that the approach to the diagnosis, investigation and treatment of hypertension differs among geographic areas, among physicians in the same geographic area and over time.³⁻¹⁹ This variation can have a detrimental effect on the effectiveness and efficiency of care.²⁰⁻²²

In an effort to minimize these variations, the Canadian Hypertension Society (CHS),²³⁻²⁷ the Fifth Report of the US Joint National Committee for the Detection, Evaluation, and Treatment of High Blood Pressure (JNC V)²⁸ and the World Health Organization (WHO)²⁹ have produced clinical practice guidelines for the management of hypertension. Of the recommendations in these guidelines, only a few can be considered grade A recommendations (based on level I evidence, i.e., randomized clinical trials with relevant clinical end points). One of the key grade A recommendations made by the CHS is that thiazide diuretics or β -adrenergic blocking agents should be the antihypertensive drugs of first choice in managing hypertension, in the absence of contraindications. The JNC V produced a similar recommendation. However,

recent drug-utilization studies conducted in the US^{7,17-19} have suggested that angiotensin-converting-enzyme (ACE) inhibitors and calcium-channel blocking agents are increasingly being used as first-line therapy, although few patients with hypertension have coexisting conditions that would warrant the first-line use of these drugs.¹⁹ In a 1992 survey, 44% of US family physicians chose an ACE inhibitor as first-line therapy for a hypothetical patient with uncomplicated essential hypertension, 22% chose a β -adrenergic blocking agent and 16% preferred a calcium-channel blocking agent.¹⁴ Very little information has been published on the prescribing preferences or practices of Canadian physicians in regard to hypertension.

Because of a lack of randomized clinical trials, there are no grade A recommendations for nonpharmacologic therapy or initial investigations in patients with hypertension. However, the consensus recommendations of the CHS, the JNC V, the American Heart Association and WHO are remarkably consistent on these issues.^{24,28-31} All have recommended that the initial laboratory tests include an electrocardiogram, microscopic urinalysis, and determination of serum levels of creatinine, potassium, glucose and cholesterol. In addition, these organizations advocate salt restriction, maintenance of ideal body weight, limitation



of alcohol intake and regular aerobic exercise for all patients with hypertension.

The CHS guidelines were published in August and September of 1993 and disseminated through the medical literature, mail-outs to Canadian physicians and continuing medical education seminars. However, whether Canadian clinicians have been influenced by these guidelines and comply with them in clinical practice is largely unknown. The purpose of this study was to assess the proportion of patients with newly diagnosed hypertension who were managed as recommended in these evidence-based guidelines.

Methods

Patients

All outpatients with a primary diagnosis of essential hypertension (codes 401.0 through 405.9 in the *International Classification of Diseases*, 9th revision) seen between Sept. 1, 1993, and Dec. 31, 1995, were identified from the billing records of participating family physicians and general internists in Edmonton. Because we wished to compare the practice patterns with the Canadian guidelines published in August and September 1993, we included only patients who were first diagnosed with hypertension after Sept. 1, 1993.

To obtain a representative sample of patients with hypertension, we approached both hypertension clinics in Edmonton, all 3 of the academic family medicine centres and a random sample of primary care clinics (4 of the 19 RJA Medicentres), community-based general internists (23 of the 46 in Edmonton) and community-based family physicians (94 in metropolitan Edmonton). Both of the hypertension clinics, 2 of the academic family medicine centres, all 4 of the primary care clinics, 13 of the community-based general internists and 44 of the community-based family physicians participated in the study. For each physician, all eligible medical records were identified and reviewed in alphabetic order until 30 patients who met the inclusion criteria were identified or the supply of records was exhausted. Patients were excluded from the sample if they were younger than 18 years, had pregnancy-associated hypertension, had a secondary cause of hypertension or were participants in clinical trials.

We collected data on the following items: patient demographic characteristics and cardiovascular risk factors recorded, tests ordered, nonpharmacologic treatment advice given, antihypertensive drugs prescribed and any contraindications to thiazide diuretics or β -adrenergic blocking agents documented. Contraindications to thiazides or β -adrenergic blocking agents were defined in advance (Appendix 1). The contraindications were ac-

cepted if they were recorded by the physician, and their strength or validity were not independently assessed. Prescriptions for antihypertensive drugs were recorded if documented in the medical records or pharmacy records for the patient. No assessment was made of compliance with the prescriptions. In patients prescribed a combination of agents, 1 prescription in the class of each component was counted. Nonpharmacologic treatment advice (defined as advice to restrict salt intake, lose weight, increase aerobic exercise, stop smoking, limit alcohol consumption or increase the calcium or potassium intake in the diet) was recorded if it was documented in the patient's record.

The study was reviewed and approved by the research ethics boards of the University of Alberta Faculty of Medicine, the Caritas Health Group and the Royal Alexandra Hospital, Edmonton.

Data collection and quality assurance

All study data were collected during a retrospective audit of the outpatient records conducted by 1 of the investigators (F.A.M.) and a study nurse from October 1995 to February 1996. A pretested and standardized manual of operations was used by both abstractors. An initial 20 records were abstracted by both abstractors to determine interobserver reliability of data on tests, nonpharmacologic therapy and prescriptions; there was perfect agreement on these variables. Data collation, quality assurance and analysis were carried out at the Epidemiology Coordinating and Research Centre (EPICORE), Division of Cardiology, University of Alberta, and the Clinical Epidemiology Unit, University of Ottawa. Quality assurance of the data was performed by scanning for missing data and for appropriateness of coding. All missing or improperly coded data were reconciled with the original medical records. Seven patients with more than 1 primary care record were excluded from the analysis.

Data analysis

To preserve the anonymity of physicians and clinics, data were aggregated and analysed by group (community-based family physicians, community-based general internists, hypertension clinic physicians, academic family medicine centre physicians and primary care clinic physicians). Practice patterns in each group were described and overall practice patterns were compared to the guideline recommendations. Differences in means were tested by analysis of variance, and the homogeneity of categorical variables among groups was tested with Cochran's Q-test or the χ^2 test. A *p* value of less than 5% was considered significant.

Results

A total of 3386 patients with hypertension were identified from the records of this cohort of physicians from Sept. 1, 1993, to Dec. 31, 1995. However, only 976 patients were newly diagnosed with hypertension after the index date (Sept. 1, 1993); exclusion of the 7 patients with duplicate medical records resulted in a final study sample of 969 patients. Of the sample, 542 patients were seen in the practices of family physicians and 427 in the practices of internists.

The patients seen by each of the physician groups were generally similar with respect to baseline characteristics, severity of hypertension and prevalence of other cardiovascular risk factors (Table 1; in the tables, groups of physicians are not explicitly identified by practice setting because of concerns about anonymity). There was considerable variation in the investigation of these patients, both among groups and among individual tests (Table 2). The data on testing in Table 2 are organized into the tests rec-

ommended in the CHS guidelines²³ (which were also recommended by the JNC V,²⁸ the American Heart Association²⁹ and WHO³⁰), those recommended only in the other guidelines and those not recommended in any hypertension guidelines. Discussion of nonpharmacologic approaches to blood pressure control was documented infrequently (Table 3). Surprisingly, according to the medical records, only 51% of the smokers with hypertension were advised to stop smoking.

Contraindications to the use of thiazide diuretics or β -adrenergic blocking agents were documented for 326 patients; 60% of these patients had hyperlipidemia, 18% had obstructive airways disease, 16% had diabetes mellitus, 6% had gout, 0.3% had severe peripheral vascular disease, 0.3% had systolic congestive heart failure, 0.3% had prior hypersensitivity, and 0.5% had prior intolerance to these agents. No patients had high-grade atrioventricular block.

Although the frequency with which agents in each drug class were prescribed varied considerably among the

Table 1: Demographic and clinical characteristics of patients with newly diagnosed hypertension

Characteristic	Physician group;* no. (and %) of patients, except where otherwise indicated					
	Group 1 n = 167	Group 2 n = 153	Group 3 n = 222	Group 4 n = 210	Group 5 n = 217	Total n = 969
Age, mean no. of years (and standard deviation)†	57.3 (13.0)	49.9 (14.8)	52.4 (13.3)	49.3 (14.3)	53.7 (14.9)	52.5 (14.2)
Female sex†	94 (56)	88 (57)	128 (58)	97 (46)	93 (43)	500 (52)
Aged 70 years or oldert	31 (19)	15 (10)	25 (11)	17 (8)	41 (19)	129 (13)
Severity of hypertension‡						
Isolated systolic	14 (8)	10 (7)	10 (5)	15 (7)	16 (7)	65 (7)
Diastolic						
Mild	40 (24)	41 (27)	78 (35)	87 (41)	62 (29)	308 (32)
Moderate	75 (45)	63 (41)	104 (47)	69 (33)	85 (39)	396 (41)
Severe	38 (23)	39 (25)	30 (14)	39 (19)	54 (25)	200 (20)
Other risk factors						
Insulin-dependent diabetes mellitus	1 (1)	0	1 (0.5)	0	5 (2)	7 (1)
Non-insulin-dependent diabetes mellitus	12 (7)	8 (5)	10 (5)	10 (5)	13 (6)	53 (5)
Hyperlipidemia	34 (20)	43 (28)	44 (20)	42 (20)	57 (26)	220 (23)
Current smoker	32 (19)	32 (21)	42 (19)	46 (22)	43 (20)	195 (20)
Obesity†	23 (14)	64 (42)	58 (26)	88 (42)	70 (32)	303 (31)
Family history of premature ischemic heart disease†	3 (2)	22 (15)	15 (7)	25 (12)	18 (8)	83 (9)
Target organ damage						
Hypertensive retinopathy†	0	19 (13)	4 (2)	37 (18)	12 (6)	72 (7)
Left ventricular hypertrophy†	8 (5)	12 (8)	2 (1)	32 (15)	15 (7)	69 (7)
Stroke or transient ischemic attack	4 (2)	4 (3)	7 (3)	12 (6)	8 (4)	35 (4)
Ischemic heart disease	3 (2)	4 (3)	12 (5)	6 (3)	9 (4)	34 (4)
Proteinuria	1 (1)	0	1 (0.5)	2 (1)	6 (3)	10 (1)
Peripheral vascular disease	1 (1)	0	2 (1)	1 (0.5)	4 (2)	8 (1)
Aortic aneurysm/dissection	2 (1)	0	1 (0.5)	1 (0.5)	1 (0.5)	5 (1)
Congestive heart failure	1 (1)	0	0	0	2 (1)	3 (0.3)

*Groups of physicians are not explicitly identified by practice setting because of concerns about anonymity.

†p < 0.05 for difference among groups.

‡Isolated systolic hypertension = diastolic blood pressure < 90 mm Hg and systolic pressure \geq 160 mm Hg; patients with combined diastolic and systolic hypertension or isolated diastolic hypertension were classified by their diastolic blood pressure as follows: mild = 90–99 mm Hg, moderate = 100–110 mm Hg, severe = > 110 mm Hg.



clinical groups, the ordinal ranking of the drug classes was relatively stable. That is, ACE inhibitors and calcium-channel blocking agents were the most commonly prescribed first-line agents in all but 1 physician group (Table 4). Of the 531 patients first started on an antihypertensive drug during the study period, only 157 (30%) were prescribed a thiazide or β -adrenergic blocking agent (the recommended drugs). Furthermore, only 161 (43%) of the 374 patients prescribed another antihypertensive as first-line therapy had a documented contraindication to one of the recommended drugs. In the 344 patients first started on an antihypertensive drug during the study period who did not have contraindications to the recommended drugs, the most frequently prescribed agents were ACE

inhibitors (147 patients, 43%) and calcium-channel blocking agents (74 patients, 22%). In the patients for whom the prescribed drug was changed within 12 months of starting therapy, the second-line agents included an ACE inhibitor in 38% of cases, a calcium-channel blocking agent in 34%, a β -adrenergic blocking agent in 16%, a thiazide diuretic in 24% and other drugs in 7%. (Percentages do not sum to 100% because 17% of patients were prescribed double therapy as second-line treatment and 2% were prescribed triple therapy.)

A univariate analysis showed that patients of family physicians were significantly more likely to receive a thiazide or β -adrenergic blocking agent than patients of internists (26% v. 13%, $p = 0.003$). A multivariate logistic

Table 2: Initial tests ordered for patients with newly diagnosed hypertension

Test	Physician group; no. (and %) of patients					
	Group 1 <i>n</i> = 167	Group 2 <i>n</i> = 153	Group 3 <i>n</i> = 222	Group 4 <i>n</i> = 25*	Group 5 <i>n</i> = 50*	Total <i>n</i> = 617
Recommended in the Canadian Hypertension Society guidelines²⁴						
Creatinine level†	106 (64)	107 (70)	187 (84)	21 (84)	45 (90)	466 (76)
Potassium level†	46 (27)	75 (49)	157 (71)	22 (88)	43 (86)	343 (56)
Sodium level†	46 (27)	68 (44)	153 (69)	20 (80)	36 (72)	323 (52)
Cholesterol level†	109 (66)	104 (68)	127 (57)	6 (24)	26 (52)	372 (60)
Glucose level†	57 (34)	49 (32)	57 (26)	10 (40)	19 (38)	192 (31)
Urinalysis†	95 (57)	74 (48)	162 (73)	17 (68)	30 (60)	378 (61)
Electrocardiogram†	71 (42)	88 (58)	96 (43)	14 (56)	34 (68)	303 (49)
Recommended in other guidelines²⁸⁻³⁰						
Hemoglobin/hematocrit†	108 (65)	98 (64)	166 (75)	14 (56)	37 (74)	423 (68)
Calcium level†	104 (63)	95 (62)	108 (49)	7 (28)	25 (50)	339 (55)
Uric acid level†	105 (63)	88 (58)	109 (49)	2 (8)	23 (46)	327 (53)
Fasting lipid levels	29 (17)	31 (21)	53 (24)	9 (36)	7 (14)	129 (21)
Not recommended^{24,28-30}						
Liver function†	103 (62)	98 (64)	110 (50)	4 (16)	23 (46)	338 (55)
Thyroid function†	46 (27)	64 (42)	45 (20)	12 (48)	13 (26)	180 (29)
Chest radiograph†	46 (27)	52 (34)	26 (12)	4 (16)	15 (30)	143 (23)
Metanephrine level†	1 (0.6)	26 (17)	11 (5)	3 (12)	12 (24)	53 (9)
Echocardiogram†	2 (1)	3 (2)	5 (2)	6 (24)	8 (16)	24 (4)
Ambulatory blood pressure monitoring†	0	0	6 (3)	9 (36)	3 (6)	18 (3)
Renal flow scan†	0	10 (7)	3 (1)	2 (8)	11 (22)	26 (4)

*Only 75 of the patients who presented to internists were given an initial work-up by the internist; the other 352 patients seen by internists had undergone some previous diagnostic tests, and these patients were excluded from this analysis.
† $p < 0.05$ for difference among groups.

Advice given	Physician group; no. (and %) of patients					
	Group 1 <i>n</i> = 167	Group 2 <i>n</i> = 153	Group 3 <i>n</i> = 222	Group 4 <i>n</i> = 210	Group 5 <i>n</i> = 217	Total <i>n</i> = 969
None*	101 (61)	95 (62)	87 (39)	67 (32)	107 (50)	457 (47)
Restrict salt intake*	38 (23)	39 (26)	80 (36)	90 (43)	67 (31)	314 (33)
Maintain ideal weight*	36 (21)	18 (12)	70 (32)	89 (42)	55 (26)	268 (28)
Increase aerobic exercise*	21 (13)	14 (9)	76 (34)	71 (34)	44 (20)	226 (23)
Limit alcohol consumption*	13 (8)	1 (0.7)	22 (10)	11 (5)	17 (8)	64 (7)
Start potassium supplementation	0	0	11 (5)	4 (2)	2 (1)	17 (2)
Start calcium supplementation*	1 (0.6)	1 (0.7)	1 (0.7)	24 (11)	4 (2)	31 (3)

* $p < 0.05$ for difference among groups.

regression analysis was performed to examine the effects of the type and magnitude of hypertension, the patient's sex and age, the type of physician (family physician v. internist), and the presence or absence of concurrent disease, target organ damage or contraindications to thiazides or β -adrenergic blocking agents on the likelihood of receiving 1 of the recommended drugs. The only variable that was significantly associated with prescription of a thiazide or β -adrenergic blocking agent was the type of physician. Specifically, the patients of family physicians were more likely to receive these drugs than the patients of internists, even when the other clinical factors were considered (odds ratio 1.5, $p = 0.01$). The prescribing patterns were similar in all subgroups of patients examined, including women and elderly people (data not shown). Of the prescriptions for antihypertensive agents, 72% of those for calcium-channel blocking agents were for dihydropyridines and 34% of those for β -adrenergic blocking agents involved agents with intrinsic sympathomimetic activity.

Discussion

As the results show, despite the recent proliferation of consensus guidelines, there was marked variation in the investigation and treatment of hypertension. According to the medical records, it appeared that nonpharmacologic advice was offered to only half of patients with newly diagnosed hypertension; recommended tests were not always done; and thiazides or β -adrenergic blocking agents were prescribed to only a minority of patients.

Although this study is retrospective, it represents a consecutive series of all patients with newly diagnosed hypertension seen by these groups of clinicians. After identification of the patients, records were reviewed in alphabetic order for convenience. Since we did not plan to include more than 30 patients seen by any 1 physician, the alphabetic review of records could have biased the sample if we had exceeded our recruitment goal with any of the physicians; however, we did not identify more than 30 eli-

gible patients from any 1 physician and, therefore, no patients were excluded for this reason. The clinicians were chosen randomly, and we believe that the results of the study accurately reflect the practice patterns in this area. The clinical features of these patients are certainly similar to those observed in the general adult population of Alberta, as documented in the Alberta Heart Health Survey.³² Our study represents the largest pattern-of-practice analysis yet reported in patients with newly diagnosed hypertension. Our findings are consistent with those of practice audits and physician surveys conducted in other settings.³⁻¹⁹ Some of the contraindications to the use of β -adrenergic blocking agents accepted in this study, such as systolic heart failure or mild hyperlipidemia, may be questioned in light of recent evidence. Other relative contraindications, such as severe depression, were not included. However, the conditions given in Appendix 1 were felt to be reasonable contraindications at the time of the study (1993 to 1995). Our conclusion that 43% of the patients prescribed an alternative to the recommended drugs as first-line therapy had a documented contraindication to thiazides or β -adrenergic blocking agents is sensitive to the definition of acceptable contraindications and may be too conservative.

The variation in the initial laboratory testing for patients with hypertension is not surprising, given the lack of definitive guidelines. Similar underutilization of recommended tests, inconsistent assessment of other cardiovascular risk factors (such as serum lipid levels) and overutilization of tests with limited usefulness (such as liver profiles and chest radiographs) have been reported in practice audits and surveys in other countries.^{10,13,15,16} Although several factors affect clinicians' test ordering,^{9,15,33} standardization of the work-up for patients with hypertension may be an area in which the efficiency of patient care could be improved.

Although nonpharmacologic advice may have been underreported in the medical records (an assumption that at least 1 group has questioned³⁴), our results are consistent with the disappointing practice patterns involving lifestyle

Table 4: Initial therapy prescribed to patients with newly diagnosed hypertension*

Therapy	Physician group; no. (and %) of patients					
	Group 1 <i>n</i> = 167	Group 2 <i>n</i> = 153	Group 3 <i>n</i> = 222	Group 4 <i>n</i> = 83†	Group 5 <i>n</i> = 86†	Total <i>n</i> = 711
Angiotensin-converting-enzyme inhibitor	73 (44)	49 (32)	66 (30)	17 (20)	33 (38)	238 (34)
Calcium-channel blocking agent	37 (22)	33 (22)	24 (11)	14 (17)	13 (15)	121 (17)
β -adrenergic blocking agent	19 (11)	18 (12)	33 (15)	1 (1)	11 (13)	82 (12)
Thiazide diuretic	19 (11)	13 (8)	30 (14)	8 (10)	5 (6)	75 (11)
Other drug	7 (4)	7 (5)	0	0	1 (1)	15 (2)
Nonpharmacologic therapy only	12 (7)	33 (22)	69 (31)	43 (52)	23 (27)	180 (25)

* χ^2 among groups and among therapies was highly significant ($p < 0.0001$).

†Of the patients seen by internists, 258 had been started on antihypertensive therapy by their primary care physician before seeing the internist and were excluded from this analysis. Only 169 of the patients seen by internists had their initial treatment plans formulated by the internist and were included in this analysis.



risk management documented by others.^{9,11,34} In particular, the surprisingly low frequency of advice on smoking cessation observed in our study mirrors the results of a physician survey by Fortmann and associates,¹¹ which found that physicians counselled only 51% of their patients with hypertension who smoked to quit smoking. The differences in management among physician groups in our study are difficult to interpret given the differences in documentation and the likelihood of a referral bias. Internists are more likely to see patients with resistant hypertension, in whom lifestyle factors often play a major role. However, our results raise concern that the most cost-effective treatments for hypertension may be underutilized in these patients.

The pattern of prescribing to these patients differs from the current recommendations of the CHS and the JNC V. The observed pattern cannot be accounted for solely by contraindications to thiazides or β -adrenergic blocking agents or by concomitant conditions (such as congestive heart failure or diabetic nephropathy) for which other agents (such as ACE inhibitors) have been shown to be efficacious. Our practice audit confirms the results of recent US studies that suggest that ACE inhibitors and calcium-channel blocking agents are commonly used as first-line therapy in patients with hypertension.^{7,17-20} Although practice audits and physician surveys carried out in Europe, Australia and New Zealand^{6,12-16} suggest that thiazides and β -adrenergic blocking agents are first-line therapy in these areas, a recent survey conducted in Sweden suggests that these patterns may also be changing.³

As discussed by Manolio and associates,⁷ several factors may play a role in influencing the prescribing of clinicians. Not least of these factors is "the attractiveness of new therapies and the desire to practice state-of-the-art medicine."⁷ The paradox identified by these authors and others is that, although there is no evidence that the newer, more expensive antihypertensive agents are more efficacious in preventing cardiovascular disease or death than thiazides or β -adrenergic blocking agents, "giving a new drug seems to spread as a contagion from one physician . . . to another."³⁵ Current studies, such as the Antihypertensive and Lipid-Lowering Heart Attack Trial (ALLHAT), the International Nifedipine Study of Intervention as Goal of Hypertension Treatment (INSIGHT) and the Hypertension Optimal Treatment (HOT) trials, may provide evidence concerning the efficacy of the new agents. However, the recent controversy over the use of calcium-channel blocking agents (or at least the short-acting forms of these drugs)³⁶ should sound a warning to clinicians to exercise caution in prescribing until there is evidence of benefit. Despite the widespread perception that the new agents are better

tolerated, randomized clinical trials have failed to document any significant differences in rates of compliance or adverse events among the different classes of antihypertensive drugs,^{37,38} moreover, a recently published practice audit confirms that blood pressure control, compliance with therapy and results of tests (including serum glucose and lipid levels) were not significantly different after treatment with the different classes of drugs.³⁹ In addition to their well-documented efficacy in preventing major cardiovascular events,⁴⁰ thiazide diuretics and β -adrenergic blocking agents are the most cost-effective alternatives in the treatment of uncomplicated essential hypertension.^{21,41}

Since clinicians do not appear to follow uniformly the evidence-based guidelines of the CHS or the JNC V in managing hypertension, further studies are required to determine which factors influence their practice.⁴² In the face of health care reform and fiscal restraint, the challenge is to find ways to optimize practice patterns and improve the efficiency of patient care. Evidence-based clinical practice guidelines are arguably the best way to achieve these ends. However, our study data compellingly suggest that the current methods of disseminating expert guidelines for management of hypertension are not effective in influencing practice patterns. As indicated by others,⁴³⁻⁴⁵ increased attention must be devoted to enhancing the implementation of guidelines and evaluating their impact.

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Appendix 1: Accepted contraindications to the use of thiazides or β -adrenergic blocking agents

- Obstructive airways disease (asthma, emphysema or chronic bronchitis)
- Insulin-dependent or non-insulin-dependent diabetes mellitus
- Hyperlipidemia (serum cholesterol level > 5.2 mmol/L or triglyceride level > 2.3 mmol/L)
- Gout
- High-grade (second- or third-degree) atrioventricular block
- Severe peripheral vascular disease (claudication after walking less than 1 block)
- Systolic congestive heart failure
- Prior intolerance or hypersensitivity