

RESEARCH LETTER

Characteristics of the patients referred to a Hypertension Unit between 1989 and 2003

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The level of blood pressure, the type of antihypertensive treatment and the prevalence of resistant hypertension at the first examination were evaluated in 6254 patients referred to a hospital Hypertension Unit from 1989 to 2003. From 1989–1993 to 1999–2003, we observed a reduced prevalence of grade 2 and grade 3 hypertension, and an increase in the prevalence of grade 1 hypertension, the proportion of treated subjects, the average number of antihypertensive drugs per patient and the prevalence of resistant hypertension.

Although guidelines strongly recommend the pharmacological treatment of hypertensive patients,^{1–3} the quality of hypertension care in Western countries remains unsatisfactory, and general practitioners are not aggressive enough in their management of hypertension.⁴ To improve hypertension care, 2003 European Society of Hypertension and Joint National Committee on Hypertension (JNC) VII Guidelines recommend to consider the referral to a specialist in case of resistant hypertension.^{1,3} To our knowledge, the characteristics of patients attending a specialist unit have been previously evaluated in an English study and in two Spanish surveys, where, though, the baseline rate of resistant hypertension was not reported.^{5–7}

We reviewed computer-stored data of 6254 Caucasian patients (age 18–90 years, 2917 males, 3337 females) referred to a hypertension clinic in Turin (Italy) from 1989 to 2003. The investigation conforms to the principles outlined in the Declaration of Helsinki. From records collected during baseline medical examinations, we obtained data about demographic characteristics (sex and age), physical features, blood pressure values, smoking status, concomitant diseases and antihypertensive medications. Blood pressure was measured in the dominant arm at the end of the physical examination, with the subject in the seated position, by using a calibrated mercury sphygmomanometer (ERKAMETER) with an appropriate size cuff. The fifth Korotkoff sound was the measure of diastolic blood pressure. The mean of three consecutive blood pressure measurements 1 min apart was considered in the study. We classified blood pressure values and defined resistant hypertension according to 2003 European Society of Hypertension-ESC Guidelines.¹ Prescription patterns of antihypertensive drugs were assessed in eight

classes: diuretics, ACE-inhibitors, angiotensin-receptor blockers, calcium-channel blockers, β -blockers, α -blockers, centrally-acting adrenergic agents and direct-acting vasodilators. We compared the patients referred to the Unit in three different periods (1989–1993, 1994–1998 and 1999–2003), chosen on the basis of the publication years of the hypertension guidelines: WHO/ISH 1989; JNC IV 1988; WHO/ISH 1993; JNC V 1993; WHO/ISH 1999; JNC VI 1997. Means and standard deviations for descriptive variables and proportions for categorical variables were calculated. We used one-way analysis of variance with Bonferroni correction for multiple comparison and Fischer's exact test to test for group differences of means and proportions, respectively. The statistical analysis was performed using the SAS package (SAS Statistical Software, Cary, NC, USA). A *P*-value of <0.05 was considered statistically significant.

Mean age significantly increased from 1989–1993 to 1999–2003, while baseline blood pressure values progressively decreased over time. After adjusting for possible confounding factors (age, body mass index and smoking status), blood pressure reduction over time was enhanced (from $163 \pm 24/100 \pm 12$ in 1989–1993 to $153 \pm 21/93 \pm 10$ in 1999–2003, $P < 0.0001$). Blood pressure reduction was maintained in both pharmacologically treated and untreated patients. The proportion of subjects taking antihypertensive medications, the average number of antihypertensive drugs per patients, and the prevalence of resistant hypertension significantly rose over time (Table 1). From 1989–1993 to 1999–2003, we observed a decreased proportion of patients taking 1 or 2 drugs (from 45 to 40% and from 37 to 33%, respectively, $P = 0.001$) and an increased proportion of patients taking 3 or ≥ 4 drugs (from 15 to 19% and from 4 to 7%, respectively, $P = 0.001$) (Supplementary Table 1). The five most frequently employed patterns of antihypertensive treatment were the following: ACE-inhibitors (17%), calcium-channel blockers (13%), ACE inhibitors plus diuretics (12%), ACE inhibitors plus calcium-channel blockers (7%) and β -blockers (6%) in 1989–1993; ACE inhibitors (13%), calcium-channel blockers (12%), ACE inhibitors plus diuretics (10%), β -blockers (8%) and ACE inhibitors plus calcium channel blockers (5%) in 1994–1998; ACE inhibitors (13%), β -blockers (9%), calcium-channel blockers (7%), ACE inhibitors plus diuretics (7%) and angiotensin-receptor blockers (5%) in 1999–2003 (Supplementary Figure 1). Temporal modifications were significant for each pattern except for β -blockers. The prevalence of coronary heart disease (1%),

Table 1 Characteristics of the examined subjects, subdivided according to the period of referral to the hypertension unit

	A (1989–93) n = 1310	B (1994–98) n = 2401	C (1999–2003) n = 2543	P-value
Mean (s.d.) age (years)	50 (14)	50 (15)	53 (14) ^{a,b}	<0.0001
Female sex	700 (53.4)	1298 (54.1)	1339 (52.7)	0.61
Mean (s.d.) BMI ^c	26.9 (4.8)	26.5 (4.5)	26.5 (4.7) ^a	0.027
Smokers	279 (21.3)	500 (20.8)	496 (19.5)	0.32
Mean (s.d.) SBP (mmHg)	162 (24)	159 (22) ^{a,d}	155 (23) ^{a,b}	<0.0001
Mean (s.d.) DBP (mmHg)	100 (12)	100 (11) ^{a,d}	94 (11) ^{a,b}	<0.0001
Blood pressure level				<0.0001
Normal	25 (1.9)	46 (1.9)	119 (4.7)	
High-normal	44 (3.4)	128 (5.3)	273 (10.7)	
Grade 1 hypertension	355 (27.1)	728 (30.3)	840 (33.0)	
Grade 2 hypertension	430 (32.8)	824 (34.3)	745 (29.3)	
Grade 3 hypertension	456 (34.8)	675 (28.1)	566 (22.3)	
Treated subjects	992 (75.7)	1775 (73.9)	1966 (77.3)	0.02
Mean (s.d.) number of drugs per subject	1.79 (0.85)	1.86 (0.93)	1.94 (0.97) ^{a,b}	<0.0001
Resistant hypertension	178 (13.6)	396 (16.5)	465 (18.3)	0.001

Abbreviations: BMI, body mass index; DBP, diastolic blood pressure; SBP, systolic blood pressure. Values are numbers (percentages) of patients unless otherwise stated. P-values for differences between groups are calculated with one-way analysis of variance or χ^2 test. ^aVersus group A (Bonferroni correction for multiple comparison). ^bVersus group B (Bonferroni correction for multiple comparison). ^cCalculated as Kg m^{-2} . ^dVersus group C (Bonferroni correction for multiple comparison).

congestive heart failure (0.5%), renal impairment (defined as serum creatinine $>1.5 \text{ mg dl}^{-1}$ in men and 1.4 mg dl^{-1} in women) (1%), proteinuria $>300 \text{ mg/24 h}$ (0.5%) and peripheral vascular disease (1%) were constant over time. The prevalence of diabetes slightly decreased ($P=0.002$) from 1989–1993 (5%) to 1999–2003 (4%), while the prevalence of cerebrovascular disease increased from 1% in 1989–1993 to 2% in 1999–2003 ($P=0.003$) (Supplementary Tables 2–4).

The great majority of the patients were referred to our specialist unit by primary care physicians. Therefore, the results of the present study represents an indirect assessment of general practitioners' attitudes in the management of hypertension. Mean blood pressure values at the time of admission were similar to those reported in previous studies, that, though, did not examined secular trends of blood pressure.^{5–7} In our study, ACE inhibitors alone were the most frequently used drug before admission to our unit, followed by calcium-channel blockers alone and the association of ACE inhibitors plus diuretics. In 1999–2003, monotherapy with β -blockers represents the second most common pattern. These data are consistent with the study by Poluzzi *et al.*⁸ which identified ACE inhibitors, calcium-channel blockers, β -blockers and ACE inhibitors plus diuretics as the four most common antihypertensive patterns prescribed by Italian general practitioners as initial treatment during 1999. Similarly, according to Malacco *et al.*⁹ Italian physicians prescribe mainly ACE inhibitors as first-choice antihypertensive drugs, followed by dihydropyridine calcium-channel blockers, angiotensin-receptor blockers and β -blockers. The increased use of multidrug therapy and the increased occurrence of resistant hypertension we observed from 1989–1993 to 1999–2003 is consistent with the indications of

1997 JNC VI¹⁰ and 1999 WHO-ISH,¹¹—successively confirmed by 2003 JNC VII³ and 2003 WHO-ISH.² We did observe a still high percentage of patients not treated or taking 1–2 drugs only, together with an increased occurrence of normal/high-normal blood pressure and grade 1 hypertension. This suggests that many primary care physicians choose to refer patients with uncomplicated hypertension to a hypertension specialist, instead of undertaking or maintaining the management of the patient. In the light of the observations that only an appropriate intervention of primary care providers will have a

What is known about this topic?

- Some studies suggest that the rate of adequate blood pressure control in Western countries remains unsatisfactory and that primary care physicians are not aggressive enough in their management of hypertension.⁴
- 2003 ESH and JNC VII Guidelines recommend to consider the referral to a hypertension specialist in case of resistant hypertension.^{1,3}
- The characteristics of the patients attending a specialist unit have been previously evaluated in some surveys, where, though, the baseline rate of resistant hypertension is not reported.^{5–7}

What this study adds?

- The increased blood pressure control and the greater use of combination therapy we found among the subjects referred to a hypertension unit from 1989 to 2003 suggest a little enhancement in pharmacological management of hypertension among primary care physician over time.
- Consistently, the increased occurrence of resistant hypertension indicates an enhanced appropriateness of the referral to a hypertension specialist.
- However, the still high percentage of patients not treated or taking 1–2 drugs only suggests that many primary care physicians choose to refer patients with uncomplicated hypertension to a hypertension specialist, instead of undertaking or maintaining the management of the patient.

major effect on hypertension control rates,¹² our study underlines the urgent need for an education of primary care providers by Hypertension Specialist.

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G Leotta, F Rabbia, A Canadè, E Testa,
G Papotti, P Mulatero and F Veglio
*Hypertension Unit, Department of Medicine and
Experimental Oncology, University of Turin, Italy,
Torino, Italy*

E-mail: gianninaleotta@virgilio.it

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Supplementary Information accompanies the paper on the Journal of Human Hypertension website (<http://www.nature.com/jhh>)