

# The DISEHTAC II Study: Diagnosis and Follow-up of Hypertension in Catalonia. Comparison With 1996 Data

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**Objective.** To evaluate the changes in the diagnosis and follow-up of hypertension, and in the evaluation of cardiovascular risk, in a population served by primary care centers in Catalonia (northeastern Spain). Management was evaluated with indicators published in the *Guidelines for Hypertension for Primary Care (Guía de Hipertensión Arterial para la Atención Primaria)*.

**Design.** Multicenter, observational before-after design (1996–2001).

**Setting.** Primary care.

**Participants.** Twelve primary care centers chosen from among the 31 centers that took part in the DISEHTAC I study (1996), with a total of 990 patient records.

**Main measures.** We analyzed age, sex, date of diagnosis of hypertension, number of blood pressure measurements needed for diagnosis, use of the mean value of duplicate blood pressure determinations, values for all blood pressure measurements in 2001, blood pressure determinations during the preceding 6 months, screening for and diagnosis of diabetes, dyslipidemia, smoking, obesity, and left ventricular hypertrophy.

**Results.** Of the 171 new cases of hypertension, 16.7% were diagnosed from at least 3 duplicate blood pressure measurements or as a result of acute episodes of hypertension. About one third (32.4%) of the patients with hypertension had blood pressure values below 140 and 90 mm Hg (25.7% in 1996), and the difference between the 2 sets of survey results was statistically significant. In three fourths (75.4%) of the patients, blood pressure had been measured during the preceding 6 months; this percentage was not significantly different in comparison to the figure found in 1996. Screening to detect cardiovascular risk factors was done in 50.4% of the patients (63.1% in 1996).

**Conclusions.** Follow-up for hypertension in Catalonia has improved notably since 1996, but there was no improvement in the diagnosis of risk factors or in the integral evaluation of cardiovascular risk.

**Key words:** Diagnosis. Hypertension. Control. Follow-up.

ESTUDIO DISEHTAC II: DIAGNÓSTICO Y SEGUIMIENTO DE LA HIPERTENSIÓN ARTERIAL EN CATALUÑA. COMPARACIÓN CON LOS DATOS DE 1996

**Objetivo.** Evaluar los cambios producidos en el diagnóstico y seguimiento de la hipertensión arterial en la población atendida en los centros de atención primaria de Cataluña y valorar el riesgo cardiovascular a partir de los indicadores publicados en la *Guía de Hipertensión Arterial para la Atención Primaria*.

**Diseño.** Estudio multicéntrico, observacional, antes-después (1996–2001).

**Emplazamiento.** Atención primaria.

**Participantes.** Doce centros de atención primaria, escogidos entre los 31 que participaron en el DISEHTAC-I (1996), con un total de 990 historias clínicas.

**Mediciones principales.** Se analizaron la edad, el sexo, la fecha de diagnóstico de hipertensión arterial, el número de tomas para el diagnóstico, la presencia de dobles tomas de la presión arterial (PA) y las medias de éstas, los valores de todas las tomas de la PA del año 2001, la presencia de control de la PA en los últimos 6 meses, y el cribado y diagnóstico de diabetes, dislipemia, hábito tabáquico, obesidad e hipertrofia ventricular izquierda.

**Resultados.** De los 171 casos nuevos de hipertensión arterial, el 16,7% fue diagnosticado con al menos 3 dobles tomas o como consecuencia de crisis hipertensivas. El 32,4% de los hipertensos presentaba cifras de PA < 140/90 mmHg (frente al 25,7% en 1996), diferencias que son estadísticamente significativas. El 75,4% de los pacientes realizó al menos 1 visita en los últimos 6 meses, sin diferencias respecto a 1996. El cribado de los factores de riesgo cardiovascular se efectuó en el 50,4% de los casos (63,1% en 1996).

**Conclusiones.** El control de la hipertensión arterial en Cataluña ha mejorado notablemente desde 1996, pero no se observa mejora en el diagnóstico de los factores de riesgo ni en la valoración integral del riesgo cardiovascular.

**Palabras clave:** Diagnóstico de la hipertensión arterial. Grado de control. Seguimiento de la hipertensión.

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## Introduction

Hypertension (HT), like diabetes and dyslipidemia, is a highly prevalent cardiovascular risk factor (CVRF) associated with high morbidity and mortality.<sup>1,2</sup> It is estimated that about 25% of all deaths from cerebrovascular disease are due to HT.<sup>3</sup>

According to published studies, the prevalence of HT ranges from 20%<sup>3</sup> or 30%<sup>4</sup> to 46.8%.<sup>5</sup> The degree of control is variable, but most current studies tend to consider control to be poor. Because of its high prevalence, the diagnosis and follow-up of HT fall mainly within the scope of primary care.

The year 2001 saw publication of the DISEHTAC I study,<sup>6</sup> whose aim was to evaluate the degree of compliance with guidelines (*Guía de Hipertensión Arterial para la Atención Primaria* [Guide to Hypertension for Primary Care], published in 1995<sup>7</sup>) for the diagnosis, control and follow-up of HT at primary care centers run under the reformed administrative system in Catalonia (northeastern Spain). The aims of the DISEHTAC II study reported here were to evaluate the changes in diagnosis and follow-up in the population served by primary care centers in Catalonia, and to evaluate cardiovascular risk according to indicators published in the 1995<sup>7</sup> and 1999 editions of the *Guía de Hipertensión Arterial para la Atención Primaria*.<sup>8</sup>

## Methods

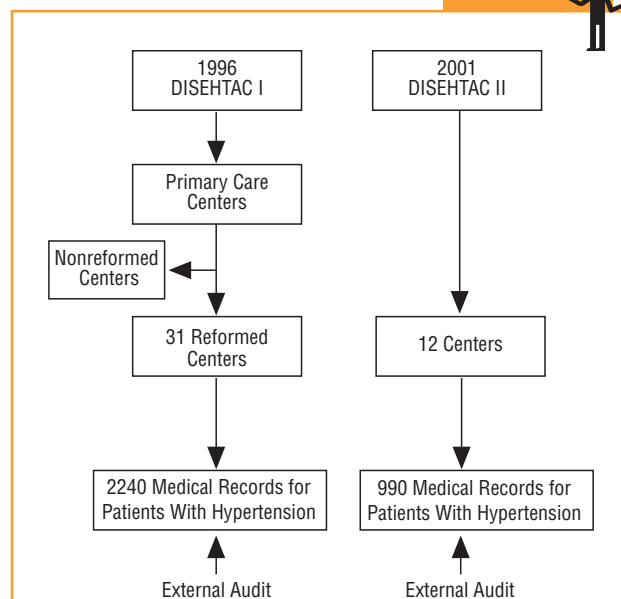
This descriptive, cross-sectional, multicenter before-after study (1996-2001) included 12 primary care centers chosen randomly from among the 31 centers that took part in the earlier DISEHTAC I survey. The sample size needed for a 95% confidence interval and a statistical precision of 3% was 953 medical records. To obtain this number of clinical records, we used the same number of records from each center as in the previous study plus 25% of this number to compensate for possible case losses. The records were chosen shortly before review with a systematic sampling method based on the list of patients with HT at centers where such a list was maintained, or from the medical records on file at centers with no such list. We chose medical records only for patients with HT. Figure 1 shows the general scheme of the study design.

After a pilot study with records from nonparticipating centers, the histories were reviewed by trained auditors unconnected with each center, who used the methods reported previously for the DISEHTAC I study.<sup>6</sup>

The study period lasted from January to December, 2001, except for new cases of HT diagnosed during the 5-year period from 1997 to 2001 inclusive. We excluded records that contained no entries for blood pressure during the year 2001.

The following variables were recorded: age, sex, date of diagnosis of HT, number of blood pressure measurements needed to reach a diagnosis, correct or incorrect diagnosis of HT, all blood pressure measurements recorded during 2001, whether blood pressure had been measured during the previous 6 months, whether the patient had been screened for diabetes, dyslipide-

## Material and methods



## General Scheme of the Study

Multicenter, observational before-after study (1996-2001) to audit management of hypertension in primary care.

mia, smoking, obesity or left ventricular hypertrophy, which of these factors had been diagnosed, and estimated cardiovascular risk. Definitions and descriptions of the variables are given in Table 1.

We calculated the same indicators of diagnosis, follow-up and control as in the DISEHTAC I study. Good control of blood pressure was evaluated on the basis of the Joint National Committee VI recommendations<sup>9</sup> and WHO recommendations,<sup>10</sup> as adopted by the Guides to Hypertension used at the primary care centers studied here.<sup>7,8</sup> Percentage results for the DISEHTAC I and DISEHTAC II studies were compared with the chi-squared test, and means were compared with Student's *t* test. Differences were considered statistically significant when  $P < .05$ . All analyses were done with version 10.1 of the SPSS.

## Results

A total of 990 medical records from 12 centers were reviewed. More than half of the patients (58.9%; 95% CI, 55.8% to 62%) were women. Mean age was 65.42 years (SD, 13.01; 95% CI, 40 to 91 years), and 58.6% were older than 65 years. Mean body mass index was 30.5 kg/m<sup>2</sup> (5.2). Demographic variables and the changes observed from 1996 to 2001 are shown in Table 2, and CVRF are compared for 1996 and 2001 in Table 3.

**TABLE 1** Description of the Variables\*

Variable	Description of the Variable
Correct diagnosis	Three duplicate measurements of blood pressure and mean values $\geq 140$ and/or 90 mm Hg or one measurement $\geq 210$ and/or 120 mm Hg
Follow-up	At least one blood pressure measurement in the previous 6 months
Screening for diabetes	At least one glucemia measurement in the previous 4 years, according to PAAPS/PAPPS criteria
Diagnosis of diabetes	Two glucemia measurements $>125$ mg/dL, according to ADA-97 criteria <sup>23</sup>
Screening for dyslipidemia	At least one cholesterol measurement in the previous 4 years <sup>22</sup>
Diagnosis of dyslipidemia	At least 2 measurements of total cholesterol with values $>200$ mg/dL
Smoking	Smoking habit recorded in medical record
Screening for obesity	Weight noted in medical record at least once
Diagnosis of obesity	BMI $\geq 25$
Screening for LVH	At least one ECG or echocardiogram in the previous 2 years
Diagnosis of LVH	Diagnosis noted in medical record

\*BMI indicates body mass index; LVH, left ventricular hypertrophy; ECG, electrocardiogram.

**TABLE 2** Characteristics of the Sample\*

	1996	2001	95% CI
Sex %	61.2	59.1	-1.5 to 5.8
Agea years	64.9 $\pm$ 13.1	65.4 $\pm$ 13	-97.3 to 97.3
Mean SBP, mm Hg	145.6 $\pm$ 14.7	144.7 $\pm$ 15.4	-0.12 to 2.12
Mean DBP, mm Hg	84.8 $\pm$ 8.7	84.3 $\pm$ 11.8	0.25-1.75†

\*CI indicates confidence interval; SD, standard deviation; SBP, systolic blood pressure; DBP, diastolic blood pressure. †Statistically significant difference.

The CVRF screened for most frequently was diabetes (92.4%; 95% CI, 91.5% to 95%) and CVRF diagnosed most frequently was obesity (65.8%; 95% CI, 62.8% to 68.7%). There were no statistically significant differences between the two periods for any of the diagnoses except for the higher percentages of patients diagnosed as having diabetes and obesity in 2001 (30.9% vs 22.1%; 95% CI, 5.4% to 12.2% for diabetes; and 63.4% vs 86.6%; 95% CI, -26% to -20.3% for obesity).

Screening for all CVRF was done in 50.4% of the patients in 2001, a percentage slightly lower than in 1996 (63.1%). This difference was statistically significant at  $P < .05$  (95% CI of the difference, 9.7% to 17.2%). In 2001, screening was done for a larger percentage of the population older than 65 years.

**TABLE 3** Percentages of Different Cardiovascular Risk Factors Screened for and Diagnosed in 1996 and 2001\*

	Percentages of CVRF screened for			Percentages of CVRF Diagnosed		
	1996	2001	95% IC	1996	2001	95% IC
Diabetes	95.9	92.4	1.6 to 5.3†	22.1	30.9	-12.2 to -5.4†
Dyslipidemia	95.6	90.7	2.8 to 6.8†	54.5	53.8	-3.8 to 4.4
Obesity	84.5	82.2	-0.5 to 5.1	63.4	86.6	-26 to -20.3†
Smoking	89.3	88.5	-15.6 to 3.1	14	18	-6.7 to 1.2
LVH	77.9	64.4	10 to 16.9†	9.2	8.1	-0.9 to 3.2

\*CVRF indicates cardiovascular risk factor; CI, confidence interval; LVH, left ventricular hypertrophy.

†Statistically significant difference.

Hypertension was diagnosed in 171 of the 990 patients (17.4%) whose 2001 records were reviewed. Of these records, 57.7% contained more than 2 entries for blood pressure. Thirty-one patients (16.7%) were correctly diagnosed.

Mean systolic blood pressure (mSBP) was 144.7 mm Hg (SD, 15.4 mm Hg) and mean diastolic blood pressure (mDBP) was 84.3 mm Hg (SD, 11.8 mm Hg). These values were lower than in the DISEHTAC I study (mSBP, 145.6 mm Hg; mDBP, 84.8 mm Hg). The difference was statistically significant only for mDBP (95% CI of the difference, 0.25 to 1.75).

Of the entire 2001 sample, 32.4% had blood pressure values  $<140$  and 90 mm Hg, a percentage much higher than in 1996 (25.7%). In the subgroup of patients with diabetes, the percentage of patients in whom blood pressure was well controlled ( $<130$  and 85 mm Hg) was 10.9%.

In the age-stratified analysis, 31.9% of the patients aged 65 years or older had blood pressure values  $<140$  and 90 mm Hg, a higher proportion than in 1996 (26.4%). This difference was statistically significant (95% CI, 0.9 to 9.9). However, there were no differences between patients older and younger than 65 years in 2001 (31.9% vs 31.5%; 95% CI, -6.4% to 4.9%). The results for the different indicators are shown in detail in Table 4.

Cardiovascular risk was calculated on the basis of the tables from the Framingham study<sup>11</sup> in only 10.3% of the medical records. We were unable to determine whether this reflected a change in comparison the 1996 data as this variable was not recorded in the DISEHTAC I study.

We found no differences in the frequency of follow-up visits in comparison to the 1996 study. When the findings were stratified by age group, we found that in 2001, patients older than 65 years had been seen more frequently to check blood pressure (26% of all patients 65 years or age or younger, and 55% in patients older than 65 years). The difference was statistically significant (95% CI, 22.9% to 34.8%).

**TABLE 4**  
**Comparison of Different Indicators for the Diagnosis, Control and Follow-up of Hypertension and for Cardiovascular Risk Factors in 1996 and 2001**

Indicator	Description	1996	2001	95% CI for the Difference
Diagnosis	Patients correctly diagnosed Total patients diagnosed during the study period	17.9%	16.7%	(-10.9 to 9.8)
Degree of control	Patients with BP <140 and 90 mm Hg Total patient with hypertension	25.7%	32.4%	(2.9 to 10.2)†
Follow-up	Patients with hypertension with a BP measurement in the preceding 6 months Total patients with hypertension	74.5%	75.4%	(-4.12 to 2.35)
Cardiovascular risk	Screening for all CVRF Total patients with hypertension	63.1%	50.4%	(9.7 to 17.2)†

\*CVRF indicates cardiovascular risk factors.

†Statistically significant confidence intervals.

## Discussion

The number of guidelines that place particular emphasis on the need for strict control of HT is increasing steadily.<sup>12,13</sup> Some guidelines establish less rigid criteria for the diagnosis of HT or include terms such as pre-hypertension<sup>12</sup> or high normal blood pressure.<sup>13</sup> However, a notion that has not changed is that because the prevalence of HT is high, the setting where this problem should initially be managed is primary care.

### Diagnosis of New Cases of Hypertension

Regarding the diagnosis of new cases of HT, it was noteworthy that the percentage of patients diagnosed after three duplicate measurements was low, although in almost 60% of all patients with HT identified *de novo* the disease was identified after more than one recording. This low percentage may be the result of underreporting, as in most cases the medical record did not specify whether blood pressure values were recorded as a single measurement or as the mean of two or more determinations.

One limitation of these results is that they are not comparable to those from the DISEHTAC I study (1996), as the earlier survey evaluated only those cases that were identified during one year. This makes it difficult to know whether the manner in which HT is diagnosed has improved or not. Likewise, we cannot tell whether our data are similar to those of other studies, as a MEDLINE search of articles published up to January 2003 revealed no studies that mentioned this factor. A finding of note, however, is

that if the new recommendations in the most recent guidelines had been used,<sup>12,13</sup> the percentage of patients correctly diagnosed would have been much larger, since the new guidelines no longer require three duplicate measurements, but base the diagnosis of HT on at least 2 individual blood pressure determinations.

### Degree of Control of Hypertension

The assumption that the degree of control achieved is still low remains widespread. However, in the present study we noted an increase in the percentage of patients whose mean blood pressure was <140 and 90 mm Hg. This represented an increase of nearly 9%, from 25.7% in 1996 to 32.4% in 2001. Improvements have also been seen in other studies. For example, Coca et al, in the national-level Controlpress 2001 study<sup>14</sup> which included 3085 patients who were receiving treatment for HT through primary care, found that blood pressure was well controlled in 28.8% of the patients. This figure increased to more than 40% when blood pressure values of 140 and 90 mm Hg or lower were considered to reflect good control. In an earlier study (Controlpress-98)<sup>15</sup> the percentage of patients with well controlled blood pressure was 16.3%. These results show that the proportion of patients whose blood pressure remained below these figures (considered to indicate good control) almost doubled.

The study most similar to ours in terms of setting was the survey by Seculi et al.<sup>16</sup> This study included 5875 individuals (not all of whom had HT) seen at primary care centers in Catalonia. The authors analyzed screening and diagnostic measures, and measures to control CVRF noted in the medical record, and reported that blood pressure was well controlled in 32.3% of the patients.

When we compared our results with those of other national-level studies, we found that the degree of control in our sample was considerably higher. For example, the VI-TAE study,<sup>17</sup> published in 1999, did not investigate control of HT but evaluated left ventricular hypertrophy. This study found that blood pressure was well controlled in 26% of the patients, a figure similar to that of the DISEHTAC I study and higher than corresponding figures in other studies published around that time. However, this figure is lower than the percentages reported in more recent studies—further evidence of improvements in the control of blood pressure during recent years.

International studies such as the one by Wolf-Maiers et al<sup>5</sup> found that in the general population, the percentage of patients whose blood pressure was well controlled was much lower in European countries. Overall, blood pressure was <140 and 90 mm Hg in 8% of the patients, although we note that this study did not provide much information about the survey methods used.

In patients older than 65 years, we found that the percentage of patients in the present study whose blood pressure was <140 and 90 mm Hg was similar to the figure given

Discussion  
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by Sécúli et al.<sup>16</sup> In the DISEHTAC II study reported here, values below 160 and 95 mm Hg were not considered to indicate an acceptable degree of control. In older patients the figures for good control of blood pressure are the same as in the rest of the population, both for reducing morbidity and mortality and for preserving cognitive function.<sup>18</sup>

#### *Screening for Different Cardiovascular Risk Factors*

We noted that in comparison to 1996, the percentage of patients who had been screened for different risk factors decreased. We feel that despite the high numbers of tests done, body weight was underreported and electrocardiograms were rarely done as part of routine follow-up. This was reflected in the low percentage of patients whose record contained an entry for screening to detect left ventricular hypertrophy, and in the discrepancies with other studies with regard to the diagnosis of this CVRF.<sup>17</sup>

With regard to obesity, many records contained a diagnosis of obesity in the absence of an entry for body mass index.

Cardiovascular risk based on the Framingham tables<sup>11</sup> was recorded in only a small percentage of cases, but we note that after 2002, this risk has frequently been noted in the medical record as part of the integral management of cardiovascular risk, and as an element of evidence for decision-making. The publication of newer tables (REGICOR,<sup>19</sup> SCORE<sup>20</sup>) may increase the use of these criteria to evaluate risk if their use spreads, or may impede efforts to evaluate risk if uncertainty remains as to which tables to use.

#### *Follow-up of Patients With Hypertension*

We found no change from 1996 to 2001 in the frequency of evidence in the medical record of at least one blood pressure determination in the previous 6 months. Follow-up recordings of blood pressure values were found for more than three fourths of the population. This finding was consistent with the results of the study by Seculi et al,<sup>16</sup> who found that blood pressure recordings ranked second behind smoking in frequency of inclusion in the patient's medical record.

Another finding in consonance with the results of Seculi et al<sup>16</sup> was that blood pressure was more likely to be recorded for older patients. Although this finding was not analyzed as such in our study, it may reflect the more frequent use of health care services by older persons than by younger patients.

However, another recent study found that there was no difference in adherence to treatment or in degree of control when patients were seen every 3 months. In principle, therefore, it does not seem necessary to increase the number of follow-up appointments.<sup>21</sup>

A limitation of our study is that the prevalence of HT at each participating primary care center is unknown. It

### What Is Known About the Subject

- Hypertension is a highly prevalent cardiovascular risk factor that is managed mainly in primary care.
- The percentage of patients with hypertension whose blood pressure was below 140 and 90 mm Hg (good control) is low.
- There is little tendency to modify treatment even when control of hypertension is poor.

### What This Study Contributes

- We analyzed follow-up measures and the course of hypertension in primary care centers 5 years after diagnosis.
- The percentage of patients whose hypertension was well controlled increased regardless of age.
- Improvement in the percentage of patients in whom hypertension was well controlled was independent of other variables such as frequency of follow-up or multifactorial management.

would be interesting to evaluate our results in the light of this information; however, the different recording systems used at each center make it difficult to compile these data. In conclusion, we note that there was substantial improvement in the degree of control of HT, and a considerable increase in the percentage of patients in whom blood pressure was considered to be well controlled.

Improvement was slowest in the use of diagnostic procedures, although according to newer guidelines based on less stringent criteria, the percentage of patients in whom HT was appropriately diagnosed was greater in 2001 than in 1996.

The use of tables agreed on by consensus<sup>22</sup> to calculate cardiovascular risk suggests that in the future, management of hypertension will be based increasingly on global cardiovascular risk.

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## COMMENTARY

## Control of Hypertension: Doing Better, But...

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Hypertension (HT), because of its high prevalence and repercussions on cardiovascular morbidity and mortality, is one of the most frequent problems encountered by family physicians in daily clinical practice, and represents one of the greatest challenges faced by these professionals. The data now available regarding the frequency and repercussions of HT are ample and solid, but so is the evidence for

the benefits of appropriate intervention. These benefits depend to a great extent (albeit with some caveats) more on the effect achieved (reduction in blood pressure) than on the method used to achieve it.

The ultimate aim of management of patients with HT, as noted in the various international consensus documents currently in use, is to reduce cardiovascular and renal mor-

## Key Points

- Reducing cardiovascular morbidity and mortality is the ultimate aim of management of different cardiovascular risk factors, including hypertension.
- Achieving this aim in patients with hypertension will require intermediate steps, most notably increasing the number of patients diagnosed, increasing the number of patients with hypertension whose blood pressure returns to normal limits, and increasing interventions aimed at other detectable risk factors.
- Published studies indicate that progress is being made, but that we are still far from achieving the desired results.

bidity and mortality. But attaining these end results means first achieving intermediate goals, which can be evaluated from an individual viewpoint or in population-based terms. If an individual focus is used, the main objectives for patients with HT are to reduce blood pressure figures (currently accepted figures for the general population are <140 mm Hg for systolic pressure and <90 mm Hg for diastolic pressure), and to reduce overall cardiovascular risk. These aims require integrated actions aimed at different risk factors. From a population-based viewpoint, the main objectives for HT are two: to identify as many patients with HT as possible (i.e., to bring the known prevalence into synch with the theoretical prevalence, according to several studies, of around 25% to 40% in the adult population), and to lower blood pressure values to below the figures given above in as many of these patients as possible.

The article on the DISEHTAC II study in this issue of *ATENCIÓN PRIMARIA* tells us how close we are to achieving some of these intermediate objectives by reporting the percentage of patients with HT whose blood pressure is within the appropriate range, and by providing information on the other cardiovascular risk factors in these patients.

The changes in the percentage of patients with HT whose blood pressure values are below the highest acceptable limit are worth some comment. Considering both national criteria (i.e., cutoff values proposed by the Controlpress study) and international criteria (for example, the cutoff values used in the National Health and Nutrition Examination Survey), the trend is favorable, with increasing percentages of patients showing good control. This trend was also seen in the DISEHTAC II study (32.4% vs 25.7% in the DISEHTAC I study in 1996). However, the trees should not prevent us from seeing the forest: although a favorable trend was apparent, only 1 of every 3 patients diagnosed as having HT had acceptable blood pressure values. Change is real but slow, so we need to think about what we could do to accelerate progress. For example, can we improve compliance with therapy? Are we doing enough to modify lifestyles? Should we use more aggressive pharmacological interventions?

Another important aspect that the DISEHTAC II study examines is the identification and management of associated cardiovascular risk factors. As noted, the ultimate aim is to reduce cardiovascular risk, but this will be hard to achieve if we do not continually evaluate risk factors and act in a coordinated manner to influence them. How each patient with HT is managed will depend on the detection of risk factors, the accurate calculation of cardiovascular risk, and the development of individualized, multifactorial interventions. In this regard the data supplied by the DISEHTAC II study are not only noteworthy, but in fact give cause for alarm: risk factors are being studied systematically in only 1 out of every 2 patients with HT, and cardiovascular risk is calculated in only 1 out of every 10 patients. Moreover, little progress has been made since the DISEHTAC I survey. Could this be due to underreporting, as the authors suggest? Are we neglecting to use integrated approaches in the management of these patients? If so, why? The answers to these questions may help us remedy these shortcomings.

The data from the DISEHTAC II study corroborate what other research has found: we are making progress in managing patients with HT, but the situation is still far from optimal. The data should not lull us into complacency, but in contrast, should spur us to seek continued improvements.