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ARTICLE

Differences based on patient gender in the management of hypertension: a multilevel analysis

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Abstract

The objective of our study was to investigate differences in the management of men and women treated for hypertension while considering the gender of their physicians. We used the data from the cross-sectional Paris Prevention in General Practice survey, where 59 randomly recruited general practitioners (42 men and 19 women) from the Paris metropolitan area enroled every patient aged 25–79 years taking antihypertensive medication and seen during a 2-week period (520 men and 666 women) in 2005–6. The presence in the medical files of six items recommended for hypertension management (blood pressure measurement, smoking status, cholesterol, creatinine, fasting blood glucose and electrocardiogram) was analysed with mixed models with random intercepts and adjusted for patient and physician characteristics. We found that the presence of all items was lower in the records of female than male patients (3.9 vs. 6.9%, $p = 0.01$), as was the percentage of items present (58.5 vs. 64.2%, $p = 0.003$). The latter gender difference was substantially more marked when the physician was a man (69.3 vs. 63.4%, $p = 0.0002$) rather than a woman (63.5 vs. 61.0%, $p = 0.46$). Although all guidelines recommend the same management for both genders, the practices of male physicians in hypertension management appear to differ according to patient gender although those of women doctors do not. Male physicians must be made aware of how their gender influences their practices.

Introduction

Hypertension is currently the leading risk factor for cardiovascular disease in the world [1] and for the past two decades has consistently been the top risk factor for overall deaths across the globe. It has also become the principal cause of risk-attributable disability-adjusted life-years (DALYs) among women worldwide [1, 2] and second among men, after tobacco use. In high-income countries, it is the fourth leading cause of DALYs for women (behind tobacco, overweight and diabetes), and fifth for men (also behind alcohol) [2].

Because of the heavy burden of hypertension-related diseases, improving the prevention and management of hypertension has become a major objective for public health authorities [3, 4]. Numerous sets of official guidelines outline appropriate patient care for hypertension, which includes clinical investigations and laboratory testing to assess patients' cardiovascular risk and to screen for hypertension-mediated organ damage [5, 6]. These guidelines are addressed especially to primary care physicians, including general practitioners (GPs), who are on the frontline for the diagnosis, treatment and follow-up of patients with hypertension [7].

The cardiovascular mortality rate has been decreasing since the 1980s in developed countries [8, 9], with half the

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decrease attributable to better preventive practices [10, 11]. This decline has not however been equal among groups; in particular, it has been more pronounced among men than women [12, 13]. This difference might be explained at least partly by gender-based differences in the management of cardiovascular risk. Studies in primary care have shown that women are less likely to be assessed for cardiovascular risk [14, 15] or to receive drugs for the treatment of risk factors including hypertension [15, 16], although official guidelines recommend similar care for both genders [5, 6].

The physician's gender has also been shown to affect patient care related to the management of cardiovascular risk and other related prevention [17–19]. Gender concordance between the patient and physician appears to have a protective effect on the quality of care [20–23]: gender-concordant pairs seem to communicate better and reach agreement more easily [20], with a favourable impact on counselling and medical care [21, 23]. At the same time, gender discordance between the patient and physician increases the risk that they will disagree and that the physician will perceive the patient negatively [20, 22]. Nonetheless, these results have not been shown consistently, and other studies on gender concordance have not found this protective effect [18, 24]. In addition, other studies have shown fewer gender-based differences in cardiovascular management in women's practices than in those of men [14, 19].

Our objective was to investigate differences in the management of men and women treated for hypertension while taking their physicians' gender into account.

Methods

Design

This study is an ancillary analysis of the Paris Prevention in General Practice survey [25]. This cross-sectional study took place in Paris and its three bordering districts from December 2004 to October 2006. It was designed to describe social inequalities in preventive care (screening for breast and cervical cancer, consumption of alcohol and tobacco and management of patients with hypertension.)

GPs were contacted at random from a telephone company listing and asked to participate. Those who did were asked to enrol every patient meeting the inclusion criteria seen during a 2-week period. Self-administered questionnaires were used to collect the doctors' demographic characteristics and information about the organisation of their practice.

Patient characteristics

Inclusion criteria for patients required that they be between 25 and 79 years of age and taking medication for high blood pressure, defined as a systolic blood pressure ≥140 mmHg or a diastolic blood pressure ≥90 mmHg. Patients' characteristics were collected both by telephone interviews of the patients by trained investigators and from the physicians by a questionnaire administered face to face, also by trained investigators. The physicians were interviewed at their office and could check the requested information in the patients' medical files. The questions included the patients' general medical follow-up (number of consultations annually and duration of physician–patient relationship), cardiovascular history and risk factors as well as the results of laboratory tests and clinical evaluations.

Patients' socioeconomic characteristics were collected with a questionnaire administered by the investigator during the telephone interview. Their educational level and health insurance status (that is, standard national health insurance, or the publicly funded special health insurance for all very low-income legal residents, providing them with free health care) were also collected.

Statistical analysis

The analysis focused on the presence in the patients' medical files of the six variables of interest—items recommended to evaluate the cardiovascular risk of these patients with hypertension and to screen for organ complications. We chose these elements based on the official guidelines on hypertension published by the French Health Authority [26] in effect at the time of the study.

These items included a blood pressure measurement within the past 6 months, smoking status (no time limit), cholesterol measurement within 3 years, creatinine measurement within 2 years, fasting blood glucose within 3 years for patients without diabetes or an HbA1c measurement within 4 months for patients known to have diabetes, and electrocardiogram (ECG) (record or report) within 3 years. We then created two variables summarising these items: all items present and percentage of recorded items.

The associations between patient gender and each variable of interest were estimated first in all patients regardless of practitioner gender (pooled analysis) and second by stratifying the patient sample according to the gender of each patient's physician (stratified analysis). We then compared the four types of physician–patient pairs (male physician-male patient, male physician-female patient, female physician-male patient, and female physician-female patient) in a pairwise analysis.

These analyses used mixed models with random intercepts and were adjusted for patient and physician characteristics known to influence patient care. For patients, the characteristics taken into account were age [27] (<50, 50–65, >65 years), number of consultations with this physician in the past year [27] (≤1, 2–4, ≥5), the duration of the

physician–patient relationship (≤1, 2–5, >5 years), educational level [28] (elementary school, middle school, high school and university), health insurance status [28] and the existence of known diabetes or cardiovascular events in the medical history (patients in secondary prevention). The adjustment factors for GPs were: age [29] (<40, 40–50, 50–60, >60 years), duration of practice [29] (<10, 10–15, 15–20, >20 years), mean duration of consultations (<15, 15–20, >20 min), mean number of consultations weekly [27](<70, 70–100, >100) and fees (that is, fixed fees or authorisation for fees beyond the amount reimbursed by the national health insurance fund).

The statistical analyses were performed with SAS software v.9.4. The National Data Protection Authority (*Commission nationale de l'informatique et des libertés*), which is responsible for ethics issues and the protection of individuals from illegal or inappropriate electronic data collection, approved the study. All patients were informed of the study's subject by their physician and provided informed consent before participating.

Results

Description of GPs

Most of the 59 participating GPs (participation rate 38.8%) were men (71%) and their mean age was 48.9 years (Standard deviation (SD) 6.7 years). The mean duration of consultations was 18.7 min (SD 5.6 min), and they worked 46.3 h a week, on average. GP characteristics did not differ according to gender (Table 1).

Table 1 Physicians' characteristics, by gender ($n = 59$).

	Men ($n = 42$) *N* (%)/mean [SD]	Women ($n = 17$) *N* (%)/mean [SD]	p[a]
Age (years)			0.39
<40	3 (7.1)	3 (17.6)	
40–49	16 (38.1)	7 (41.1)	
50–59	19 (45.2)	7 (41.1)	
≥60	4 (9.5)	0 (0.0)	
Age (years)	55.5 [10.4]	54.1 [12.9]	0.66
Mean duration of consultations (minutes)			0.98
<15	5 (11.9)	2 (11.7)	
15–20	28 (66.6)	11 (64.7)	
>20	9 (21.4)	4 (23.5)	
Mean duration of consultation (minutes)	18.4 [5.3]	19.7 [6.2]	0.45
Mean number of consultations per week			0.31
<70	7 (16.6)	1 (5.9)	
70–100	21 (50.0)	12 (0.6)	
>100	14 (33.3)	4 (23.5)	
Mean number of consultations per week	104.4 [46.3]	89.5 [22.7]	0.38
Duration of practice (years)			0.22
<10	2 (4.7)	3 (17.6)	
10–14	5 (11.9)	4 (23.5)	
15–19	11 (26.1)	3 (17.6)	
≥20	24 (57.1)	7 (41.1)	
Fees			0.22
Fixed	31 (73.8)	15 (88.2)	
Above the amount reimbursed	11 (26.2)	2 (11.7)	

[a]Chi-square test for categorical variables, T test for numeric variables with normal distributions, Wilcoxon test for numeric variables with non-normal distributions.

Description of patients

Among the 1774 eligible patients, 588 did not participate, principally for personal reasons (2/3 of exclusions) [25]. Our sample thus comprised 1186 patients (participation rate: 66.8%); more than half of them were women (54.4%). The patients' mean age was 63.3 years (SD 11.0), 62.5 (SD 10.7) among men vs. 64.0 (SD 11.1) among women, ($p = 0.013$). The mean systolic blood pressure (based on the last three in-office measurements) was 137.2 mmHg for both men (SD 12.0) and women (SD 12.6) ($p = 0.86$). LDL cholesterol levels were higher in women, with a mean level of 1.30 mmol/L (SD 0.36) compared to 1.21 mmol/L (SD 0.35) for men ($p = 0.0005$). The women were older than the men, had a lower education level, and had the special health insurance for poor residents more often (Table 2). They also saw female doctors more often. Male patients had diabetes more frequently, as well as a more frequent history of cardiovascular disease, and received on average a higher number of antihypertensive drugs (2.05 medications per patient for men (SD 1.04) vs. 1.89 (SD 0.94) for women, $p = 0.006$).

Patient gender-based differences

In the pooled analysis, the presence of each item was reported less often in the women's files, except for blood pressure measurements (no gender difference in recording) (Table 3). The women also had a significantly lower percentage of items reported in their files.

In the stratified analyses, the associations between the variables of interest and the patient's gender differed

Table 2 Patients' characteristics, by gender ($n = 1186$).

	Men ($n = 520$) N (%)/mean [SD]	Women ($n = 666$) N (%)/mean [SD]	p[a]
Age (years)			**0.03**
<50	60 (11.5)	77 (11.5)	
50–65	221 (42.6)	231 (35.7)	
>65	238 (45.9)	358 (53.7)	
Age (years)	62.5 [10.7]	64.0 [11.1]	**0.01**
Physician gender			**0.02**
Male	428 (82.3)	506 (76.0)	
Female	92 (17.7)	160 (24.0)	
Number of consultations last year with physician			0.07
≤1	41 (7.9)	32 (4.8)	
2–4	161 (31.0)	211 (31.7)	
≥5	318 (61.1)	423 (63.5)	
Duration of physician–patient relationship (years)			0.45
≤1	37 (7.1)	39 (5.9)	
2–5	136 (26.2)	167 (25.1)	
>5	347 (66.7)	460 (69.0)	
Time since diagnosis of hypertension (years)			0.58
≤2	52 (14.9)	60 (13.5)	
3–5	64 (18.3)	96 (21.5)	
>5	233 (66.8)	290 (65.0)	
Education level			**<0.0001**
Elementary school	128 (25.5)	216 (33.0)	
Middle school	158 (31.5)	238 (36.4)	
High school	76 (15.2)	86 (13.2)	
University	139 (27.8)	114 (17.4)	
Health insurance status			**0.05**
CMU[b]	17 (3.3)	38 (5.8)	
Standard insurance	494 (96.7)	617 (94.2)	
History of cardiovascular disease			**<0.0001**
Yes	137 (26.3)	86 (12.9)	
No	383 (73.6)	580 (87.1)	
Diabetes			**0.0003**
Yes	125 (24.0)	106 (15.9)	
No	395 (76.0)	560 (84.1)	
Systolic blood pressure level[c] (mmHg)	137.2 [12.0]	137.2 [12.6]	0.86
Diastolic blood pressure level[c] (mmHg)	80.3 [7.5]	80.2 [7.4]	0.92
Controlled hypertension[d]			0.44
Yes	288 (56.7)	384 (59.0)	
No	220 (43.3)	267 (41.0)	
Number of antihypertensive drugs taken[e]			**0.02**
1	187 (36.6)	269 (40.8)	
2–3	271 (53.0)	353 (53.5)	
>3	53 (10.4)	38 (5.8)	
Number of antihypertensive drugs taken	2.05 (1.04)	1.89 (0.94)	**0.006**
LDL cholesterol level (mmol/L)	1.30 (0.36)	1.21 (0.35)	**0.0005**

Bold values identify statistical significance $p < 0.05$ (risk alpha < 5%).

[a]Mixed logistic models with random intercept.

[b]*CMU couverture médicale universelle*, universal medical coverage: publicly funded health insurance for low-income patients.

[c]Based on the last three in-office measurement.

[d]Defined as a mean systolic blood pressure <140 mmHg and a mean diastolic blood pressure <90 mmHg based on the last three in-office measurement.

[e]15 missing data (nine for women and six for men).

according to physician gender. The associations among the male physicians were the same as in the pooled analysis except for the ECG record, for which the difference was not significant. Although the differences based on patient gender were more marked for ECG record and cholesterol measurement among female than male GPs, no variable differed between the male and female patients of the female physicians. The two summary variables however suggested men received slightly better management.

Physician–patient pairs

Male patients seeing male physicians had their smoking status recorded more frequently in their medical files than any of the other three patient–physician pairs, and significantly more of them had all six items recorded in their files (Table 4). The percentage of items recorded in the medical files was also significantly higher for this man-man pair compared to the other three, while the percentages of items recorded for male and female patients of female physicians did not differ significantly.

Discussion

Our study shows that even among patients treated for hypertension, a major cardiovascular risk factor, the medical management of women is less satisfactory than that of men. This is the case despite the existence of clear official guidelines recommending the same management for both genders. This difference based on patient gender appears to be substantially more marked when the physician is a man.

Some previous studies have shown that women patients tend to receive less care for cardiovascular issues than men, including less management of hypertension, regardless of their physician's gender [13, 15]. The gender-based differences disadvantaging women seen in our study are similar to those observed in other studies about primary [14] and secondary cardiovascular prevention [16, 30]. GPs appear to be more thorough in the medical monitoring of the cardiovascular risk of their male compared with female patients. The gender-based difference in the management of hypertension among patients might be related to the widespread general perception and representation that cardiovascular disease, the main complication of hypertension, is a man's disease [31, 32]. GPs might therefore subjectively consider the women among their patients to be at lower risk and accordingly perform fewer procedures or order fewer tests for them, that is, give them less medical care. Another explanation for this difference might be the higher cardiovascular risk level in the male patients in our study, with a higher number of patients with diabetes and secondary prevention among the men. However, the medical

Table 3 Patient gender differences in medical management of hypertension, with and without stratification by general practitioners' gender ($n = 1141$).

	All physicians				Male physicians				Female physicians			
	Male patients ($n = 496$) %[a]	Female patients ($n = 645$) %[a]	OR[a] (ref. = men) [95% CI]	p	Male patients ($n = 406$) %[a]	Female patients ($n = 493$) %[a]	OR[a] (ref. = men) [95% CI]	p	Male patients ($n = 90$) %[a]	Female patients ($n = 152$) %[a]	OR[a] (ref. = men) [95% CI]	p
Blood pressure[b]	95.5	95.2	0.92 [0.58–1.48]	0.76	97.7	97.4	0.86 [0.50–1.50]	0.61	94.3	95.9	1.40 [0.44–4.49]	0.56
Smoking status	29.9	20.1	0.59 [0.42–0.81]	**0.001**	33.2	20.7	0.52 [0.36–0.75]	**0.0006**	11.1	11.3	1.05 [0.47–2.33]	0.89
Cholesterol[c]	81.3	75.4	0.70 [0.50–0.96]	**0.03**	81.9	75.7	0.69 [0.48–0.98]	**0.03**	86.7	80.9	0.64 [0.27–1.52]	0.32
Creatinine[d]	75.8	68.7	0.70 [0.50–0.97]	**0.03**	77.6	70.0	0.67 [0.46–0.97]	**0.03**	74.9	71.0	0.82 [0.37–1.79]	0.61
Fasting blood glucose[c] or HbA1c for patients with diabetes[e]	75.6	69.0	0.71 [0.52–0.97]	**0.03**	77.7	70.6	0.69 [0.49–0.96]	**0.03**	72.2	71.2	0.95 [0.44–2.02]	0.89
Electrocardiogram[c]	55.9	48.6	0.74 [0.56–0.98]	**0.04**	57.9	52.0	0.78 [0.57–1.07]	0.13	51.4	39.9	0.62 [0.31–1.23]	0.17
All items present	6.9	3.9	0.55 [0.35–0.88]	**0.01**	4.2	2.0	0.48 [0.28–0.81]	**0.006**	2.7	2.5	0.94 [0.28–3.14]	0.92
Percentage of items recorded	64.2	58.5	0.78 [0.68–0.89]	**0.0003**	69.3	63.4	0.75 [0.65–0.87]	**0.0002**	63.5	61.0	0.90 [0.67–1.20]	0.46

Bold values identify statistical significance $p < 0.05$ (risk alpha < 5%).

HbA1c glycated haemoglobin, *OR* odds ratio, *CI* confidence interval.

[a]Mixed models with random intercept adjusted for patient characteristics (age, number of consultations during the last year, duration of patient–physician relationship, education level, health insurance status, history of diabetes and cardiovascular events) and physician characteristics (age, duration of practice, mean duration of consultations, mean number of consultations weekly, fee sector).

[b]Measurement within the last 6 months.

[c]Measurement or report within the last 3 years.

[d]Measurement within the last 2 years.

[e]Measurement within the last 4 months.

Table 4 Differences in medical management of patients with hypertension according to the gender composition of the physician–patient pairs ($n = 1141$).

	Gender composition of physician–patient pairs[a]	%[b]	OR[b] [95% CI]	*p*
Blood pressure[c]	Male–male	96.1	1.19 [0.70–2.02]	0.71
	Male–female	95.4	1	
	Female–male	92.9	0.63 [0.19–2.12]	
	Female–female	94.9	0.91 [0.29–2.84]	
Smoking status	Male–male	34.8	**1.87 [1.30–2.68]**	**0.003**
	Male–female	22.2	1	
	Female–male	15.8	0.66 [0.23–1.91]	
	Female–female	15.4	0.64 [0.23–1.74]	
Cholesterol[d]	Male–male	81.5	**1.46 [1.02–2.08]**	0.18
	Male–female	75.0	**1**	
	Female–male	80.8	1.39 [0.64–3.02]	
	Female–female	76.5	1.08 [0.55–2.10]	
Creatinine[e]	Male–male	76.7	**1.47 [1.02–2.12]**	0.17
	Male–female	69.1	1	
	Female–male	72.2	1.16 [0.49–2.73]	
	Female–female	67.7	0.94 [0.43–2.03]	
Fasting blood glucose[c] or HbA1c for patients with diabetes[f]	Male–male	77.7	**1.50 [1.06–2.11]**	0.08
	Male–female	69.8	1	
	Female–male	67.1	0.88 [0.42–1.83]	
	Female–female	66.8	0.86 [0.45–1.67]	
Electrocardiogram[d]	Male–male	53.8	1.25 [0.91–1.71]	0.10
	Male–female	51.2	1	
	Female–male	53.8	1.10 [0.55–2.20]	
	Female–female	40.8	0.65 [0.35–1.20]	
All items present	Male–male	4.8	**2.11 [1.26–3.54]**	**0.03**
	Male–female	2.2	1	
	Female–male	1.4	1.01 [0.31–3.26]	
	Female–female	1.8	1.15 [0.41–3.26]	
Percentage of items recorded	Male–male	69.1	**1.34 [1.15–1.55]**	**0.001**
	Male–female	63.1	1	
	Female–male	61.9	1.07 [0.81–1.41]	
	Female–female	58.8	0.98 [0.80–1.21]	

Bold values identify statistical significance $p < 0.05$ (risk alpha < 5%).

HbA1c glycated haemoglobin, *OR* odds ratio, *CI* confidence interval.

[a]Numbers in pair sets: male physician-male patient = 406; male physician-female patient = 493; female physician-male patient = 90; female physician-female patient = 152.

[b]Mixed models with random intercept adjusted for patient characteristics (age, number of consultations during the last year, duration of patient–physician relationship, education level, health insurance status, history of diabetes and cardiovascular events) and physician characteristics (age, duration of practice, mean duration of consultations, mean number of consultations weekly, fee sector).

[c]Measurement within the last 6 months.

[d]Measurement or record within the last 3 years.

[e]Measurement within the last 2 years.

[f]Measurement within the last 4 months.

surveillance analysed in our study is the minimal follow-up recommended for hypertensive patients [26, 33], regardless of cardiovascular risk level or gender. While a higher cardiovascular risk might explain more frequent check-ups than those analysed in our study for the men, it would not medically justify less than the minimal recommended surveillance for hypertensive patients in women. Moreover, we adjusted for patient history of diabetes and cardiovascular

events in the main analysis and still found significant differences between genders. Finally, analyses stratified for primary or secondary cardiovascular prevention, history of diabetes and systolic blood pressure were performed (supplementary tables S1, S2 and S3). Except for patients with systolic blood pressure equal or superior to 140 mmHg or a diastolic blood pressure equal or superior to 90 mmHg, for whom no gender differences were significant, all these analyses are consistent with our main finding and showed a percentage of items recorded significantly higher in men across all groups. Under these circumstances, it seems unlikely that patient cardiovascular risk level alone could explain our findings.

In our study, management of patients with hypertension also varied according to the physician's gender. Gender-based differences are more widespread among male GPs than among their female counterparts. Several findings might explain why men have a more gender-based approach than female doctors do and tend to monitor their male patients more closely. First, studies have shown that the influence of gender concordance is not the same for men and women: interactions between men tend to be more cooperative than those between women. This greater cooperation might lead to a better relationship between GPs and their patients when both are men and therefore to better medical management [34]. Second, women have been shown to be more concerned about equality and more strongly influenced by norms [34, 35]. This might be the reason that female physicians follow guidelines more routinely, interpret them less personally and therefore provide gender-based care less often than their male counterparts. Third, the lower quality of the monitoring by male GPs of female patients might be related to the men's gender-based perceptions of their patients. Specifically, a study of the association between GP gender and their perceptions of patients showed that male GPs tend to consider that the medical condition of their male patients is more severe than that of their female patients and tend to be less inclined to think they have covert concerns they have difficulty expressing [22]. They might accordingly be less worried about the health of their female patients and therefore provide them with less medical care.

Our study has several limitations. First, the relatively small number of physicians included and their gender imbalance is the main limitation of this secondary analysis. In mixed models, power depends first on the number of level 2 subjects (the physician level in our case) [36]. Accordingly, the lack of significant associations between the dependent variables and patient gender in the group of female physicians might be due to insufficient power in this stratum. We cannot rule out the possibility of gender-based differences in their patient management. Nonetheless, the lower amplitude of the ORs observed in this stratum for most of the dependent variables suggests that the men's practices are more unfavourable than those of women to the female patients.

Another limitation of our study is that it did not consider the patients' individual cardiovascular risks. Nonetheless, we adjusted for diabetes and cardiovascular disease in the patient histories (secondary prevention) to avoid this bias. Moreover, we observed that although the distribution of men in secondary prevention was the same for both male and female physicians (26%), male GPs had a much higher percentage of high-risk women among their patients (15% vs. 7%), which should have resulted in reducing the gender-based differences in their care of men and women. The analyses stratified by patients requiring primary and secondary cardiovascular prevention are presented in the appendix (supplementary tables S1 and S4) and are consistent with our main findings.

Furthermore, the time passed since these data were collected is also a limitation. The study was conducted more than a decade ago and practices may have changed in the meantime. Nonetheless, a comparison between the French guidelines at the time of the study [26] and the current guidelines [5] shows very few differences in the recommended elements of clinical and laboratory monitoring for patients with hypertension. Both advise clinical monitoring of patients at least every 6 months with blood pressure measurements, a laboratory blood sample every 2–3 years including monitoring of renal function, cholesterol, and fasting blood glucose and an ECG every 3–5 years. The current European guidelines are similar, recommending medical visits every 3–6 months and laboratory tests every 2 years [6]. In view of the absence of any major changes in the recommended management of hypertension between the guidelines in effect at the time of the study and the most recent ones and as gender-based differences in hypertension management by primary care physicians have not previously been investigated, our results seem likely to reflect current medical practices.

Another limitation of our study is that it did not analyse the presence of proteinuria in the medical files, although it is a necessary component of the recommended management. Finally, our survey about preventive care might have selected physicians especially interested in preventive medicine. The participating GPs might thus have adhered more closely to guidelines than the average GP, which would result in less patient gender-related variation between their practices. This could explain these differences observed between male and female GPs, but only if the selection phenomenon was stronger among the women. They did not, however, have better practices than their male counterparts, which suggests that this selection effect was not higher among them.

The major strength of our study is its originality, as to our knowledge, only one previous study has analysed

gender-based differences in the treatment of hypertensive patients according to the physician's gender [19]. That survey showed that female patients met their blood pressure target more often when treated by women, compared with men. However, the lack of adjustment of the analyses (except for age) suggests that some of these gender differences for patient outcome might be due to the prescription of different medication regimens for men and women. In addition, the statistical tests of that survey, unlike our study, did not take into account the hierarchical structure of the data.

Physicians, particularly men, must be made aware of how their own personal characteristics, especially their gender, influence their practices. The influence of gender-based stereotypes in patient care and the subsequent inequalities in care it causes should be emphasised in medical studies and in the communication between health authorities and physicians in practice. This is particularly true for cardiovascular diseases with their high mortality rates, for which inequalities between the care received by men and women have been repeatedly demonstrated.

Summary table

What is known about topic

- Cardiovascular mortality has decreased since the 1980' thanks to better prevention but the decline has been more important for men than for women.
- Hypertension is the leading risk factor for cardiovascular disease in the world.
- Studies have shown that women are less likely to be assessed and treated for their cardiovascular risk factors including hypertension and that the physician's as well as the patient's gender can influence patient care.

What this study adds

- Even among patients already diagnosed and treated for hypertension, patient care for women is satisfactory than for men
- The physician's gender has an influence on patient care: male physicians made more differences based on gender in patient care than their female counterparts.

Code availability

The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

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