

The cost of treating high blood pressure in general practice in France

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Abstract In this study, the cost of having high blood pressure treated by French general practitioners was estimated, using an analysis of the computerized records for 28,015 patients with either hypertension or history of hypertension over three years. Costs due to visits, drugs, and complementary tests were included. The average annual cost of treatment was 597€ (SD 377€). The annual average cost of drugs was 447€, and antihypertensive drugs 258€. The average annual cost of patients who were controlled throughout the period was 537€, patients who were normalized cost 595€, and patients who deteriorated cost 612€.

Keywords Hypertension · Cost · Family practice

JEL Classification I12

Introduction

In France, high blood pressure (HBP) affects 16.5% of the population over 20 years of age [12]. The prevalence of

this condition is 6.8 million, and 5.6 million of these are treated for it. Two factors are crucial to the effectiveness of the treatment: the adequacy of the drugs prescribed and the quality of follow-up, as well as the compliance to diet and healthy behavior. Both international and national recommendations have been published on this issue [1, 7, 22].

Nevertheless, Berlowitz and Poggi [4, 16] have shown that even for those receiving treatment, blood pressure is higher than normal for 76% of patients, which may put them at risk of major cardio- or cerebrovascular events. Thus, effectiveness in stabilizing blood pressure at a normal level should translate into a reduction in cardio- and cerebrovascular morbidity and mortality [4, 19]. From an economic perspective, there are two questions about such treatments that we might ask. First, different treatments for HBP exist, so which is the most cost-effective at preventing severe events? Second, do treated patients that are not at goal (i.e., normal blood pressure) use more resources than patients at goal, or fewer resources? Published data suggest that the treatment of patients not at goal, not including the costs of treating serious adverse events, costs more than that of patients with normalized blood pressure [3, 8, 10, 14, 15, 17, 18, 21]. Paramore [15] has found that patients not at goal had more drugs prescribed and more visits than patients at goal.

The aim of the study was to document this question in the French context, using a cohort of 28,015 patients treated in general practice for high blood pressure and followed over a three-year period. All direct medical resources generated by the physicians and related to HBP were recorded, i.e., visits, drug prescriptions, lab tests, and other diagnostic procedures. Costs included are only direct medical costs, for all payers and for the National Sickness Fund. Potential savings related to improved control of HBP have been estimated.

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Table 1 Cardiovascular risk stratification according to the WHO risk classes [17]

BP grades	Risk classes			
	I. No RF from the list, no comorbidities	II. 1 or 2 RF from the list ^a	III. 3 RF from the list, or diabetes or organ failure	IV. Cardiovascular diseases with HBP
(0) Normal: SBP < 140 mmHg, DBP < 90 mmHg	–	–	–	–
(1) SBP 140–159 mmHg, DBP 90–99 mmHg	Low	Moderate	High	Very high
(2) SBP 160–179 mmHg, DBP 100–109 mmHg	Moderate	Moderate	High	Very high
(3) SBP ≥ 180 mmHg, DBP ≥ 110 mmHg	High	Very high	Very high	Very high

BP Blood pressure, SBP systolic blood pressure, DBP diastolic blood pressure, RF risk factors

^a Risk factors: age > 55 for women, age > 65 for men, smoking, hypercholesterolemia, family history of CV disease, obesity

Method

We performed a retrospective analysis of a cohort of patients treated for HBP and followed for three years by French general practitioners in private practice. Individual patient data was extracted from the Thalès panel, operated by CEGEDIM, a French commercial company specializing in market analysis in health care. At the time of the extraction, in 2002, the panel comprised 589 general practitioners using the same computerized medical records. In terms of age, gender, geographic location, and level of activity, the panel is representative of the general population of French GPs. Patients followed by the panelists have the same age and gender distribution as the population of insureds of the National Sickness Fund followed by GPs. The main bias is linked to the fact that the panelists actually use computerized medical records, which is not the case for all French GPs.

Patients were included in the study based on the following criteria: (a) age was over 18 at the time of inclusion (D0); (b) the presence of a diagnosis or a history of HBP during the first year of inclusion (from 1 March 1999 to 30 April 30 2000); (c) there was at least one prescription of antihypertensive drugs in the same period; (d) there was follow-up for hypertension of at least 36 ± 3 months (history of disease: 24 months before D0 and 12 months after); (e) at least three measures of blood pressure over these 36 ± 3 months were available. Hypertension during pregnancy, for iatrogenic reasons, along with high catecholamine, for cardiovascular erythrmism, and secondary hyperaldosteronemia were excluded. Normal blood pressure was defined as a systolic blood pressure of <140 mmHg, and a diastolic blood pressure of <90 mmHg.

Data collected per patient were the following: patient age, sex, occupation, medical history, size, weight, and insurance status. Data collected per visit include one or several diagnoses, drug prescriptions, and number of days of sick leave, physical and biological parameters (e.g., blood pressure), lab tests, and referral to a specialist. Only visits for HBP, its risk

factors, and relevant comorbidities were studied. Using the histories of the patients, the comorbidities, and the blood pressure levels, it was possible to classify each patient in one of the 16 WHO cardiovascular risk groups (Table 1, [22]). Henceforth, blood pressure levels will be referred to using the Grade 0–4 scale of the WHO guidelines. In panels such as Thalès, comorbidities are indicated by doctors, but in most cases with no biological measures: this was the case for hypercholesterolemia, diabetes, and proteinuria. Obesity was defined by a BMI of ≥ 30 .

Resources used are related to the treatment by the GPs of HBP and/or its associated risk factors. Drugs were selected using the EPHMRA classification with crossvalidation for allowed indications in the VIDAL dictionary [9], then split in two groups: drugs acting on blood pressure, and other drugs (other cardiovascular drugs, treatment of obesity, of diabetes, potassium, drugs for tobacco cessation, antifibrinolytic agents, antiplatelet aggregating agents). A cardiologist consultant selected risk factors and complementary tests related to HBP.

Total cost (CT) over the period is the sum of three elements: cost of visits (CC), cost of drugs (CM), and cost of complementary exams (CE). Annual cost (CA) was equal to $CT \times 12/N$, where N is the number of months of follow-up. Total cost is the total expenditure incurred by the patient.

The charge for a visit to the GP was 20€ (2000, National Fee Schedule). Cost of exams were also valued by the National Fee Schedule for lab tests (2000 [20]). Cost of drugs was equal to the number of boxes prescribed times the public price of the box (2000 [9]).

Data were treated using SPSSTM for Windows. A transversal analysis was performed, computing the annual cost for each patient. Patients were segmented according to initial health state using the WHO classification of HBP patients, and of the type of treatment for HBP. Univariate analysis was based on a t -test for independent samples ($p < 0.001$). A longitudinal analysis compared total costs per patient over the period as a function of their initial

Table 2 Transition matrices according to BP level and risk class

	End									
	Grade 0		Grade 1		Grade 2		Grade 3		Total	
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
<i>Number of patients per BP grade</i>										
Day 0										
Grade 0	4,296	15.3	3 17	11.3	517	1.8	91	0.3	8,074	28.8
Grade 1	4,504	16.1	8,207	29.3	1,686	6.0	316	1.1	14,713	52.5
Grade 2	889	3.2	2,073	7.4	896	3.2	221	0.8	4,079	14.6
Grade 3	197	0.7	471	1.7	299	1.1	182	0.6	1,149	4.1
Total	9,886	35.3	13,921	49.7	3,398	12.1	810	2.9	28,015	100.0
	End									
	Class I		Class II		Class III		Class IV		Total	
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
<i>Number of patients per risk class</i>										
Day 0										
Class I	2,875	10.3	999	3.6	6	0.0	6	0.0	3,886	13.9
Class II	0	0	13,148	46.9	598	2.1	62	0.2	13,808	49.3
Class III	0	0	0	0	4,746	16.9	35	0.1	4,781	17.1
Class IV	0	0	0	0	0	0	5,540	19.8	5,540	19.8
Total	2,875	10.3	14,147	50.5	5,350	19.1	5,643	20.1	28,015	100.0

health status (first visit in the database) and final health status (last visit in the database). The differences in costs for patients with an effective treatment versus the others were tested. Effectiveness is gauged by the lowering of blood pressure and/or by the evolution of the health status over time. At the end of the period, patients can have either normal blood pressure, see their blood pressure increase relative to the first visit, or have the same blood pressure as observed at first visit.

Results

Patient characteristics and changes in health status

A total of 28,015 patients were included. Average age was 66.1 (SD 11.9), 44.1% were men. Data on occupation were missing for 15.7% of patients. Otherwise, 32.9% of patients were working, 67.1% were out of work; of these, 52.7% were retired.

At inclusion, 28.8% of patients (*n* = 8,074) had normal blood pressure (Grade 0, SBP < 140, DBP < 90), 52.5% (*n* = 14,713) were classified Grade 1 (SBP from 140 to 159, DBP from 90 to 99), 14.6% (*n* = 4,079) Grade 2 (SBP from 160 to 179, DBP from 100 to 109), and 4.1% (*n* = 1,149) Grade 3 (SBP over 179 and DBP over 109). In

terms of risk factors, 13.9% of patients (*n* = 3,886) were in WHO Class 1, 49.3% of patients (*n* = 13,808) were in Class II, 17.1% (*n* = 4,781) in Class III, and 19.8% (*n* = 5,540) in Class IV. After three years of treatment, 35.3% of patients (*n* = 9,886) had normal blood pressure, 49.7% of patients were Grade 1 (*n* = 13,921), 12.1% were Grade 2 (*n* = 3,398), and only 2.9% were Grade 4 (*n* = 810). Thus, globally, the patients improved their level of blood pressure (Table 2).

When combining both blood pressure levels and risk classes, 17% of patients (*n* = 4,751) were very high cardiovascular risk patients at day 0, versus 15.3% (4,289) at the end of the period.

This trend hides contrasting evolutions. Actually, 15.3% of patients had a normal level at inclusion and at the end of follow-up (*n* = 4,296), 20% of patients improved to normal (*n* = 5,590), 10.1% (*n* = 2,830) improved but were not at a normal level, 33.2% were stable but not at a normal level (*n* = 9,285), and 21.4% (*n* = 6,014) had a higher blood pressure at the end of the period.

At inclusion, the most frequent risk factors and comorbidities were hypercholesterolemia (41.4%), obesity (24.7%), other cardiovascular diseases (19.8%), and diabetes (16.7%). The main changes during the period were for obesity, with a 29.4% increase: from 6,907 patients to 8,938.

Table 3 Transition matrix: CV risk stratification

BP	Class									
	I		II		III		IV		Total	
	Day 0	End	Day 0	End	Day 0	End	Day 0	End	Day 0	End
Grade 0	1,447	1,338	3,892	4,942	1,187	1,682	1,548	1,924	8,074	9,886
Grade 1	1,842	1,189	7,426	7,154	2,593	2,767	2,852	2,811	14,713	13,921
Grade 2	457	292	1,960	1,660	772	722	890	724	4,079	3,398
Grade 3	140	56	530	391	229	179	250	184	1,149	810
Total	3,886	2,875	13,808	14,147	4,781	5,350	5,540	5,643	28,015	28,015

Numbers in bold are very high risk patients

Number of very high risk patients at D0 = 530 + 229 + 250 + 890 + 2,852 = 4,751

Number of very high risk patients at end = 391 + 179 + 184 + 724 + 2,811 = 4,289

Follow-up and treatment

Patients had an average of 19.8 visits (SD 9.6) for HBP and relevant risk factors over the period. Blood pressure was measured 16.7 times on average over three years (SD 8.9), prescriptions for antihypertensive drugs were written 25.8 times (SD 19.3), and 75.8% of patients had at least one lab test prescribed. The average number of lines of prescriptions written for HBP and risk factors was 45.4 ± 38.5 per patient; 9.8% of patients were referred at least once to a cardiologist. Patients with high blood pressure at the beginning of the period had more visits and more measurements were taken of their blood pressure, but the number of drugs prescribed was the same for all grades of hypertension.

All classes of antihypertensive drugs were prescribed: 60.2% of patients had at least one prescription of diuretics over the period, 46.2% of patients had at least one prescription of an ACE, 43.6% a beta-blocker, 37.2% a calcium antagonist, 25.9% an angiotensin II antagonist, and 19.7% a synthetic antihypertensive drug; 65% of patients were prescribed a drug for cardiovascular risk factors, 25% for metabolic risk factors, and 17% for blood and hematopoietic organs. Prescriptions of angiotensin II antagonists increased by a factor of 2.5 over the period, replacing mainly ACEs. This is linked to the short delay between the beginning of the survey and the date of the launch of angiotensin II antagonists in France. At the end of the study period, the number of patients with only one antihypertensive drug had decreased 17.2%.

Drug costs were the main driver of the total cost: patients with four or more drugs prescribed cost 1,033€ (SD 501€) versus 490€ (SD 315€) for patients on just one therapy. Table 3 presents the evolution of drug treatments for HBP over the period. Overall, treatment intensity has increased. The share of patients with one HBP drug dropped from 51.1 to 42.3%, most of the patients moving to

bitherapy (from 34 to 36.4%) or to tritherapy (from 11.8 to 16%). The share of patients with four or more antihypertensive drugs decreased from 5.3 to 3.1%. Accordingly, the average cost of patients increased with the intensity of treatment. Thus, patients who started on monotherapy had an overall average drug cost of €490 (SD €315), while the average cost was 1,033€ (SD 501€) for patients who started with four or more drugs. Bold numbers represent the costs of patients with no change in treatment intensity. A patient who stayed on monotherapy during the whole period had an average cost of 447€ (SD 291€); a patient with four or more drugs during the whole period presented with an average cost of 1,032€ (SD 494€) (Table 4).

Average total medical cost per patient over the period was 1,797€ \pm 1,133€, or 597€ \pm 377€ per year and per patient. Median annual cost was 511€. Visits were 22.0% of total cost, drugs 74.9%, and tests and diagnostic procedures 3.0%. The annual average cost of drug treatment was 447€, and antihypertensive drugs cost 258€ (57.7% of total cost of drugs).

Cost per year and per health status, transversal analysis

Annual average costs per patient group at first visit using the WHO risk group classification are presented in Table 5. The annual average cost per group varied as a function of the level of blood pressure and the risk group. A patient in risk group IV.3 costs on average three times more than a patient in risk group I.0 (934€ versus 324€, $p < 0.001$). The risk group is the main determinant of costs: for all levels of blood pressure, patients in risk group IV are a factor of 2.5 costlier than patients in risk group I, whereas the impact of HBP grades is more modest: the cost difference between Grade 3 patients and Grade 0 patients increases along with the risk class (62€ for risk class I, 109–154€ for other classes, $p < 0.001$ for all two-by-two comparisons).

Table 4 Average annual cost of care per patient (in €) according to initial and final antihypertensive treatment

Initial	Final														
	Monotherapy			Bitherapy			Tritherapy			≥4 drugs			Total		
	Ave.	SD	N	Ave.	SD	N	Ave.	SD	N	Ave.	SD	N	Ave.	SD	N
Monotherapy	447	291	10,319	568	329	3,158	696	367	717	879	415	119	490	315	14,313
Bitherapy	588	347	1,313	604	342	6,358	754	378	1,533	974	472	310	638	364	9,514
Tritherapy	729	409	185	781	398	619	806	393	2,047	1,016	483	470	827	416	3,321
≥4 drugs	941	538	31	1,149	628	65	1,010	462	186	1,032	494	585	1,033	501	867
Total	469	307	11,848	607	351	10,200	779	392	4,483	1,003	481	1,484	597	377	28,015

Ave. average, SD standard deviation, N number of patients

Table 5 Average annual cost of care in € per patient, per WHO risk group and BP level at inclusion

	Grade 0			Grade 1			Grade 2			Grade 3			Total		
	Ave.	SD	N	Ave.	SD	N	Ave.	SD	N	Ave.	SD	N	Ave.	SD	N
Class I	324	184	1,447	365	200	1,842	384	205	457	386	207	140	353	496	3,886
Class II	483	272	3,892	511	276	7,426	554	303	1,960	592	348	530	512	283	13,808
Class III	707	359	1,187	742	391	2,593	794	401	772	861	418	229	748	388	4,781
Class IV	813	452	1,548	849	472	2,852	894	460	890	934	543	250	850	469	5,540
Total	550	358	8,074	599	374	14,713	655	393	4,079	695	441	1,149	597	377	28,015

Ave. average, SD Standard deviation, N number of patients

Cost per year and per health status, longitudinal analysis

Annual cost was computed according to initial and final blood pressure levels. Table 6 is double entry: lines (i) are initial blood pressure grade; columns (j) are final blood pressure grade (both grades relate to the WHO Risk Class). Each cell (i, j) is the annual average cost per patient with initial grade i and final grade j (Table 6).

Patients with normal initial and final blood pressures generated the lowest average cost, 537€ (SD 352€). The highest cost, 771€, was for patients who were Grade 3 at both initial and final visits. Reading numbers in the same column, differences between cells can be interpreted as the extra cost required to lower the blood pressure from one grade to another. In all columns, this average cost increased with the level of blood pressure. For example, the annual average cost for patients with a Grade 3 blood pressure level at the first day of follow-up and a Grade 0 blood pressure level at the end of the period was 654€, versus 537€ for patients with a normal blood pressure at the first day of follow-up and termination (Table 6).

The same analysis was performed per risk class. For example, the treatment for a Class II patient at the first day of follow-up and termination cost 506€, and it was 642€ if

the patient became a Class III patient at the end of the period (p < 0.001). The number of Class IV patients was too small to allow for comparisons (Table 7).

Finally, three groups of patients can be identified from the longitudinal analysis: patients with a normal blood pressure during the whole period (n = 4,296), patients who improve to normal blood pressure (n = 5,590), and patients who are resistant to treatment (n = 18,129). The first group incurred an annual average cost of 537€, versus 595€ for the second group, and 612€ for the third group (p < 0.001).

Overall budget impact

The total annual expenditure for the 28,015 patients in the cohort amounted to 16,725,590€. 9,886 patients were either maintained at a normal blood pressure level or improved to normal. Thus, the annual cost per patient controlled over three years was €1,715 (€16,725,590/9,886), and the NTT for one controlled patient was 28,015/9,886 = 2.83 patients over three years. The number of patients with HBP who are treated is estimated to be 5.6 million, so the total annual budget for the ambulatory management of HBP in France was around 3.34 billion €, representing 2.3% of all health care expenditure.

Table 6 Average annual cost per patient according to initial and final BP levels

Day 0	End														
	Grade 0			Grade 1			Grade 2			Grade 3			Total		
	Ave.	SD	N	Ave.	SD	N	Ave.	SD	N	Ave.	SD	N	Ave.	SD	N
Grade 0	537	352	4,296	559	360	3 17	585	362	517	664	483	91	550	358	8,074
Grade 1	589	375	4,504	597	366	8,027	627	404	1,686	657	388	316	599	374	14,713
Grade 2	613	371	889	658	394	2,073	686	402	896	657	420	221	655	393	4,079
Grade 3	654	405	197	663	407	471	727	473	299	771	495	182	695	441	1,149
Total	570	367	9,886	600	372	19,921	645	406	3,398	683	435	810	597	377	28,015

Ave. average, SD standard deviation, N number of patients

Table 7 Average annual cost per patient according to initial and final WHO risk groups

Day 0	End														
	Class I			Class II			Class III			Class IV			Total		
	Ave.	SD	N	Ave.	SD	N	Ave.	SD	N	Ave.	SD	N	Ave.	SD	N
Class I	339	186	2,875	390	215	999	711	408	6	275	101	6	353	196	3,886
Class II	–	–	0	506	279	13,148	642	335	598	600	277	62	512	283	13,808
Class III	–	–	0	–	–	0	746	387	4,746	1,010	469	35	748	388	4,781
Class IV	–	–	0	–	–	0	–	–	0	850	469	5,540	850	469	5,540
Total	339	186	2,875	498	277	14,147	734	383	5,350	847	468	5,643	597	377	28,015

Ave. average, SD Standard deviation, N number of patients

Discussion

Sampling bias

Our cohort of high blood pressure patients is the largest yet studied in France in terms of numbers and length of follow-up period. However, because it was derived from a panel, and not from a prospective study with a structured questionnaire, it can be expected that extracting data from real practice medical records, where doctors have discretion over the registration of events, results in the patients' health status being underrecorded. Moreover, the periodicity of the measurements of blood pressure level was quite variable. To control for biases, we compared the population of patients to the data available in France. A study was performed in 1994 among 235 French general practitioners to assess the prevalence, treatment and control of hypertensive patients in community practice [6]. The French publication did not provide a detailed description of the study population, which concluded that 24% of treated patients had SBP < 140 and DBP < 90. The National Sickness Fund issued two studies on severe hypertensive patients, involving 10,665 and 2,649 patients, respectively, studied in 1999. The objective of those studies was to

compare actual practice to published recommendations [11]. Note that the patients in those studies were unhealthier than the patients described in this study: more patients were diabetic (21.9 vs. 17%), obese (47.3 vs. 31.9%), and had a history of stroke (12.2 vs. 4.3%) or heart failure (10.8 vs. 4.2%). In terms of prescription patterns, we found less aggressive treatments in our cohort when compared to the National Sickness Fund study, since only severely hypertensive patients were included in the latter. The percentage of patients with SBP < 140 and DBP < 90 was 25.9% in this study.

CREDES, an institutional research group affiliated to the National Sickness Fund, issued a study of a population similar to ours in terms of sociodemographic characteristics and patient risk profiles [12]. Data were from the years 1991 and 1992. That study is suggestive of a possible underdeclaration of smoking habits in our study (13 vs. 3%).

Clinical outcomes

Other studies have been published in different countries, with the aim of assessing the degree of control over blood pressure in patients under treatment. In the USA, based on the National Health and Nutrition Examination Survey

(NHANES), Burt et al. [5] have established that the rate of treated hypertensive patients of ages between 18 and 74 with SBP < 140 and DBP < 90 increased from 32% in the period 1976–1980 (NHANES II) to 55% in the period 1988–1991 (NHANES III). In a retrospective study of patients from a large health maintenance organization, Alexander et al. [2] found an overall rate of 30.4% of patients with a mean SBP < 140 and DBP < 90 monitored over a one-year observation period. They found that younger patients tended to be better controlled than older ones. Unfortunately, it is not clear whether all of the patients were actively treated for HBP. Still in the USA, Berlowitz et al. [4] found that 24% of treated hypertensive patients had a controlled BP according to our definition. This low rate contrasts with the results from NHANES III. Patients in the study had a mean age of 65.5 years, which is close to that of our study group, but they were presumably older than the general population studied in [5]. In a retrospective study of a cohort of 1,000 patients (average age 65.1) from a managed care organization, followed for two years, Paramore [15] found that 44.5% of patients were controlled according to the definition used previously. Using the 1999–2000 data reported by NHANES, Hajjar et al. [13] found that 53.1% of treated patients were controlled according to the same definition as above. This is consistent in terms of order of magnitude with the previous NHANES survey study. Differences from [4] and [15] in terms of the rate of control are probably explained by differences in mean age (around 45 years in the NHANES groups versus 60.7 in [2] and 65.5 years in [15]).

Rates of control in other countries appear to be lower than in the USA, using the NHANES data as a reference. Using surveys published in the 1990s, Wolf-Maier et al. [23] found that an average rate of 8% of all patients diagnosed hypertensive in six European countries (Germany, Finland, Sweden, England, Spain, and Italy) had SBP < 140 and DBP < 90, compared to an average of 23% in Canada and in the USA (persons 35–64 years of age). This was due to a lower treatment rate in Europe versus North America (26.8 vs. 44.4%). In a second study, Wolf-Maier et al. [24] also established a difference in the rate of control for treated patients (age 35–64) between the USA and Canada (respectively, 54.5 and 47.3%) and five European countries, with England having the highest rate (40.3%) and Spain the lowest (18.7%). Thus, our results would position France in an intermediate position just after England and before Germany.

Cost estimation

Because the design of the study was limited to general practice, the cost of treatment is underestimated, since it does not account for care delivered by cardiologists in an

ambulatory setting or hospital care. Moreover, according to the panel managers of Thalès, there is an underdeclaration of referral practices to specialists and of lab tests, and no information on patients that eventually visit another doctor during the period of study. Other published studies give an indication of the total cost of treating HBP in France. Frérot et al. [12] have found an annual average cost of 1,181€. This cost includes medical expenditures not attributable to HBP. Fender [11] found that the National Sickness Fund reimbursed on average 3,581€ per year to patients with severe HBP. Medical fees were 440€, drugs 902€, lab tests were 93€. Hospital bills represented 1,630€ and other expenditures 519€. Summing up medical fees, drugs and lab tests (a total of 1,435€ per year) allows for a comparison with our results. Differences can be attributed to the fact that the Thalès panel does not include care provided by specialists, and the Fender study focuses on severe persistent HBP. For such patients, it can be assumed that drug costs are higher and that referral to a cardiologist is more frequent than in the general population that we have studied.

Conclusion

The study showed that antihypertensive drug management in France changed over the three years of the study, as the application of multitherapy strategies and the rate of controlled people increased, and a significant number of patients showed improvements in their BP levels. In this study, we found that it was necessary to spend 5,000€ over three years, or treat three patients for each one with normal blood pressure after three years. This number probably underestimates the true cost per “controlled” patient, but it may be a useful figure to use when modeling the cost-effectiveness of the management of HBP in a general population, in order to avoid severe cardio- and cerebrovascular events.

Limitations aside, the study demonstrated that patients that improved their BP levels cost less on average than patients with persistently high or even worsening blood pressure levels, even if they did not attain normal BPs. This suggests that improving the health status of patients generates savings. This finding may support the assumption that effective treatment of BP not only reduces the risk of occurrence of severe cardio- or cerebrovascular events, thus avoiding expensive care, but it also generates savings, because patients have a better health status and use fewer health care resources. Finally, data showed that management of the associated risk factors was more expansive than the management of BP per se.

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