Original article

How Beta-Blockers Are Used in Spain? Analysis of Limitations in Their Use in Internal Medicine and Cardiology: CARACTER-BETA Study

Xavier Garcia-Moll,a,* Lorenzo Fálica,b Pedro Conthe,c Antonio Zapata,d Remei Artigas,d Vicente Bertomeu,e and José Ramón González-Juanatey,f on behalf of the CARACTER-BETA study investigators

aServicio de Cardiología, Hospital de la Santa Creu i Sant Pau, Barcelona, Spain
bServicio de Cardiología, Consorcio Hospital General Universitario de Valencia, Valencia, Spain
cServicio de Medicina Interna, Hospital General Universitario Gregorio Marañón, Madrid, Spain
dServicio de Cardiología, Hospital de San Juan, San Juan de Alicante, Alicante, Spain
eServicio de Cardiología, Hospital Clínico Universitario, Santiago de Compostela, A Coruña, Spain
fServicio de Cardiología, Hospital Clínico Universitario, Santander, Spain

Article history:
Received 31 January 2011
Accepted 29 May 2011
Available online 31 August 2011

Keywords:
Stable angina
Atrial fibrillation
Heart failure
Beta-blockers

ABSTRACT

Introduction and objectives: Beta-blocker treatment has a class I indication, level of evidence A, in guidelines for the treatment of heart failure, ischemic heart disease, and atrial fibrillation. However, beta-blocker use continues to be less than optimal. In this study, beta-blocker use in Spain is analyzed in patients with heart failure, ischemic heart disease, and atrial fibrillation.

Methods: Observational, epidemiologic, cross-sectional, multicenter study including 1608 patients with heart failure, ischemic heart disease, and/or atrial fibrillation, recruited in 150 healthcare centers by cardiologists and internal medicine specialists.

Results: Cardiologists enrolled 78.6% patients and internal medicine specialists 21.4%; 25.8% were recruited at hospital discharge and 74.2% at outpatient centers. Men accounted for 77% of the sample, and age was 68 (12) years. Of the total, 73% had ischemic heart disease, 42% heart failure, and 36% atrial fibrillation (multiregression variable). beta-blockers were given to 82.8% of those consulting in cardiology compared to 71.6% of those treated in internal medicine (P<.0001). By pathology, the prescription rate was 85.1% of patients with ischemic heart disease, 77.0% of those with heart failure, and 72.4% of those with atrial fibrillation. Cardiology prescribed significantly more beta-blockers for ischemic heart disease and heart failure than did internal medicine. Multivariate analysis showed that beta-blocker use increased when the patient had ischemic heart disease, was treated by a cardiologist, and had dyslipidemia, stroke, and/or left ventricular hypertrophy. Beta-blocker use decreased with age and with a history of bronchospasm, asthma, bradycardia, chronic obstructive pulmonary disease, and/or intermittent claudication.

Conclusions: There is still room for improvement in beta-blocker prescription in Spain for patients with ischemic heart disease, heart failure, and/or atrial fibrillation.

© 2011 Sociedad Española de Cardiología. Published by Elsevier España, S.L. All rights reserved.

¿Cómo se usan los bloqueadores beta en España? Análisis de las limitaciones para su uso en medicina interna y cardiología: estudio CARACTER-BETA

RESUMEN

Introducción y objetivos: El tratamiento con bloqueadores beta tiene una indicación de clase I y nivel de evidencia A en las guías de tratamiento de insuficiencia cardíaca, cardiopatía isquémica y fibrilación auricular. A pesar de ello, el uso de bloqueadores beta sigue siendo inferior a lo deseable. El objetivo principal del estudio es analizar el uso de los bloqueadores beta en España en pacientes con cardiopatía isquémica, insuficiencia cardíaca, fibrilación auricular.

Métodos: Estudio epidemiológico observacional, transversal y multicéntrico, que incluye a 1.608 pacientes con cardiopatía isquémica, insuficiencia cardíaca y/o fibrilación auricular reclutados en 150 centros sanitarios por cardiólogos y médicos internistas.

Resultados: El 78,6% de los pacientes fueron incluidos en cardiólogía, y el 21,4%, en medicina interna; se recogió al 25,8% en altas hospitalarias y al 74,2%, en consultas externas. El 67% eran varones. La media de edad era 68 ± 12 años. El 73% tenía cardiopatía isquémica; el 42%, insuficiencia cardíaca, y el 36%, fibrilación auricular (variable multiregresión). El 82,8% de los tratados en cardiólogía recibió bloqueadores beta, frente al 71,6% de los tratados en medicina interna (p < 0,0001). Por enfermedades, el 85,1% de los pacientes con

* Corresponding author: Servicio de Cardiología, Hospital de la Santa Creu i Sant Pau, Sant Antoni Maria Claret 167, 08025 Barcelona, Spain.
E-mail address: xgarcia-moll@santpau.cat (X. Garcia-Moll).
○ The appendix lists the names of the investigators who participated in the first phase of the CARACTER-BETA study.

1885-5857/5 – see front matter © 2011 Sociedad Española de Cardiología. Published by Elsevier España, S.L. All rights reserved.
doi:10.1016/j.rec.2011.05.027
INTRODUCTION

Cardiovascular diseases constitute an important public health problem. These severe chronic conditions, particularly ischemic heart disease and cerebrovascular disease, are the main cause of death in our society.\(^1\)

The prevalence of some of these conditions, for example, chronic heart failure (CHF), is continuously increasing (around 10% in the population older than 70 years),\(^2\) affecting the quality of life and survival of patients. The prognosis of patients with heart disease has improved with the advances in preventing cardiovascular risk factors and in treatments, but mortality and morbidity rates remain very high. This is due, in part, to improper use of medication with a proven beneficial effect on cardiovascular disease in general, such as antiplatelet agents, lipid-lowering drugs, angiotensin-converting enzyme inhibitors (ACEIs), and beta-blockers (BBs).\(^3,4\)

BB treatment has a significant role in cardiovascular disease, being used for years because of its anti-ischemic, antiarrhythmic, and antihypertensive properties. The favorable effects of adrenergic blockade have been recently established in patients with heart failure.\(^5\) The benefits and clinical indications for BB use have been clearly established in several European and American guidelines for the diagnosis and treatment of these conditions (eg, CHF, stable angina, atrial fibrillation [AF]).\(^6-8\) and there is consensus on their use with a class I indication, level of evidence A, in the treatment of chronic ischemic heart disease, CHF, and AF (in this last indication, together with nondihydropyridine calcium channel blockers). Nonetheless, adherence to the guidelines in general and to the use of BBs in particular remains less rigorous that would be desirable and is very disparate between European countries.\(^9-11\)

The main objective of this study is to determine the therapeutic use of BBs for class I indications, level of evidence A (ischemic heart disease, CHF, and/or AF) in the clinical practice of specialists prescribing treatment for these patients. The secondary aims are to evaluate which factors determine the use of BBs and whether there are differences regarding the medical specialties in which these patients are treated.

METHODS

CARACTER-BETA is a multicenter, cross-sectional, observational study, performed under the aegis of the Hypertension Section of the Spanish Society of Cardiology and conducted in Spain.

Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACEI</td>
<td>angiotensin converting enzyme inhibitor</td>
</tr>
<tr>
<td>AF</td>
<td>atrial fibrillation</td>
</tr>
<tr>
<td>BB</td>
<td>beta-blockers</td>
</tr>
<tr>
<td>CHF</td>
<td>chronic heart failure</td>
</tr>
<tr>
<td>COPD</td>
<td>chronic obstructive pulmonary disease</td>
</tr>
</tbody>
</table>

Statistical Analysis and Sample Calculation

The main study variable was the percentage of patients who, at the time of the visit, were receiving pharmacological treatment in keeping with the guidelines of the European Society of Cardiology, in particular regarding BB use (treated/untreated, indicated/not indicated because of a contraindication).

Sample Size Calculation

The sample size was calculated assuming maximal uncertainty or indifference (\(p=q=0.5\)) related to the therapeutic approach in the use of BBs, because of the fact that precise, homogeneous data were not available. Therefore, based on inclusion of 1800 patients in the study, it was calculated that a precision of 2.3% would be achieved.
in estimating a percentage by a normal bilateral asymptotic 95% confidence interval, assuming that the percentage would be 50% and setting the patient loss rate due to incomplete data at 10%. Nonetheless, following a quality control process of the data obtained, 1582 patients were ultimately included in the study. Because the premise of maximum uncertainty or indifference was not met in the study, but instead was $P = 0.804$ and $q = 0.196$, and assuming the same confidence interval, the degree of precision reached was calculated at 1.96%, which was better than the initial target.

**Statistical Analysis**

The descriptive statistics included the distribution of frequencies, measures of central tendency, standard deviation, and calculation of 95% confidence intervals. Bivariate analysis of categorical values was performed by comparing contingency tables, using the $\chi^2$ test with variables of a nominal type and the Fisher exact test when appropriate. Continuous variables that met the assumptions of normality for dichotomous variables were analyzed with the Student $t$ test and variables with more than 2 categories, by analysis of variance. Variables with a non-normal distribution were analyzed with the Mann-Whitney $U$ test and Kruskal-Wallis test, respectively. The principal study variable, BB use, underwent descriptive evaluation and logistic regression analysis using the stepwise method and including all factors that could have an influence on BB prescription. Significance was set at a two-tailed $P$ value of .05.

**RESULTS**

A total of 1608 patients from across the country were recruited, and 1582 (98.38%) patients fulfilled the selection criteria for inclusion in the analysis. Of the patients included, 79% were from cardiology (1244 patients vs 338 patients from internal medicine), 26% had been discharged from hospital, and 74% were from outpatient clinics.

The baseline characteristics of the population studied are shown in Table 1 and the baseline analytical parameters are summarized in Table 2.

Mean age of the study patients was 67.5 (11.6) years, two-thirds were men, and the mean body mass index was 28.35 (4.15). The body mass index was $\geq 25$ in 81.1% of patients. Mean abdominal girth was 97.8 (13.18) cm, and 47.7% of patients had criteria for abdominal obesity (men, $>102$ cm; women, $>88$ cm). The prevalence of hypertension was 72.2%, diabetes mellitus 31.7%, and dyslipidemia 62.8%.

Patients seen in cardiology were younger (66.6 [11.6] vs 70.8 [10.9] years in internal medicine; $P < .0001$) and there was a higher

**Table 1**

<table>
<thead>
<tr>
<th></th>
<th>Cardiology</th>
<th>Internal medicine</th>
<th>$P$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men, %</td>
<td>67</td>
<td>60</td>
<td>.0027</td>
</tr>
<tr>
<td>Age, years</td>
<td>66.6</td>
<td>70.8</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Systolic pressure, mmHg</td>
<td>133.8 (19.7)</td>
<td>138.1 (18.9)</td>
<td>.001</td>
</tr>
<tr>
<td>Diastolic pressure, mmHg</td>
<td>76.4 (11.3)</td>
<td>78.9 (18.9)</td>
<td>.0007</td>
</tr>
<tr>
<td>Heart rate, bpm</td>
<td>70 (13)</td>
<td>74 (12)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Hypertension, %</td>
<td>70</td>
<td>81.1</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Diabetes mellitus, %</td>
<td>28</td>
<td>45.3</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Dyslipidemia, %</td>
<td>63.4</td>
<td>60.4</td>
<td>NS</td>
</tr>
<tr>
<td>Stroke, %</td>
<td>7.6</td>
<td>17.8</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>LVH on ECG, %</td>
<td>42.9</td>
<td>47.4</td>
<td>.037</td>
</tr>
<tr>
<td>Intermittent claudication, %</td>
<td>5.8</td>
<td>11.8</td>
<td>.0003</td>
</tr>
<tr>
<td>COPD, %</td>
<td>9.7</td>
<td>12.1</td>
<td>.19</td>
</tr>
</tbody>
</table>

COPD, chronic obstructive pulmonary disease; ECG, electrocardiography; LVH, left ventricular hypertrophy.

Data expressed as the mean (standard deviation), unless otherwise indicated.
Thus, with baseline deviation.

Table 8
Baseline Laboratory Data of the Study Population

<table>
<thead>
<tr>
<th>Analytic parameters</th>
<th>Median (SD) range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hematocrit, %</td>
<td>40.4 (5.9) 10.8-60</td>
</tr>
<tr>
<td>Hemoglobin, g/dL</td>
<td>14.1 (3.98) 1.2-53</td>
</tr>
<tr>
<td>Creatinine, mg/dL</td>
<td>1.1 (0.45) 0.1-8.7</td>
</tr>
<tr>
<td>Total cholesterol, mg/dL</td>
<td>189.11 (42.16) 79-346</td>
</tr>
<tr>
<td>HDLC, mg/dL</td>
<td>45.44 (13.45) 10-137</td>
</tr>
<tr>
<td>LDLc, mg/dL</td>
<td>113.76 (35.64) 24-268</td>
</tr>
<tr>
<td>Triglycerides, mg/dL</td>
<td>143.91 (79.44) 28-1085</td>
</tr>
<tr>
<td>Glucose, mg/dL</td>
<td>113.43 (37.53) 20.9-470</td>
</tr>
<tr>
<td>Glycohemoglobin, %</td>
<td>6.84 (1.59) 1-14.2</td>
</tr>
<tr>
<td>Sodium, mEq/L</td>
<td>139.86 (3.71) 105-153</td>
</tr>
<tr>
<td>Potassium, mEq/L</td>
<td>4.39 (0.5) 2.9-6.4</td>
</tr>
<tr>
<td>BNP, pg/mL; median (95% CI) range</td>
<td>77.5 (213.99-750.44) 15-6100</td>
</tr>
</tbody>
</table>

BNP, B-type natriuretic peptide; CI, confidence interval; HDLC, high-density lipoprotein cholesterol; LDLc, low-density lipoprotein cholesterol; SD, standard deviation.

The reasons why BB treatment was not prescribed in cardiology and internal medicine are shown in Figure 2. In internal medicine, an “unfavorable social situation” was given as the main limitation to prescribing BBs. It is worthy of note that the presence of a respiratory disorder was more often the reason for not prescribing BBs in cardiology than in internal medicine, despite the fact that there is a higher prevalence of these disorders in patients treated by internal medicine specialists. In contrast, bradycardia and diabetes mellitus were more important reasons for not prescribing these drugs in internal medicine than in cardiology.

**Beta-Blockers in Ischemic Heart Disease**

The most common condition under study was ischemic heart disease (72.6% of patients), in which BB use was high, always exceeding 80%. No differences in prescribing these drugs were observed between outpatient treatment and at hospital discharge (84.0% vs 87.9%, respectively). However, their use was more frequent in cardiology than in internal medicine (86.3% vs 80.3%; P<.05). The most commonly used combined regimen was a BB, ACEI, antiplatelet agent, and lipid-lowering drug (42.1% of patients with ischemic heart disease).

**Beta-Blockers in Heart Failure**

Among the patients included, 41.8% had CHF. New York Heart Association functional class II was the most common (54.5%), accounting for 46% of hospital admissions during the year prior to the study. A depressed ejection fraction (left ventricular ejection fraction <35%) was documented in 46%. Use of BBs was less intense in patients with CHF, with no significant variation between outpatient prescription and hospital discharge (76.9 vs 77%). Similar to what was seen in ischemic heart disease, CHF patients treated in cardiology received BBs more often than patients treated in internal medicine (81.7% vs 64.2%; P<.0005). The most commonly used combination was a BB, ACEI/angiotensin II receptor antagonist, antiplatelet/anticoagulant, diuretic, and lipid-lowering drug (46.4% of CHF patients).

**Beta-Blockers in Atrial Fibrillation**

Among the total series, 35.5% of patients had AF. The diagnosis of this condition had been made in the 3 years before the study (interquartile range, 1-6 years). In 55.6%, AF was permanent, and 25.2% of patients had undergone cardioversion in the previous 2 years. Treatment with BBs was similar in both settings under consideration (outpatient, 71.6%; hospital discharge, 74.8%) and in both medical specialities (cardiology, 74.3%; internal medicine, 66.7%). The most commonly prescribed combination was a BB, ACEI/angiotensin II receptor antagonist, and an anticoagulant (23.1% of FA patients).

**Other Treatment**

The treatments patients received are summarized in Figure 3. Proper use of the other drug groups is evident, such as lipid-lowering drugs, antiplatelet agents, ACEI, and angiotensin II receptor antagonists. These findings are consistent with recently published data in Spanish registries of ischemic heart disease.12

**Independent Predictors of Beta-Blocker Use**

The use or not of BBs was considered the dependent variable, and the following variables were considered explicative

**Reasons for Not Prescribing Beta-Blockers**

BB were not prescribed in 19.6% of all patients: in 5.7%, it was not considered to be indicated, in 11.7% it was not prescribed because of a specific reason, and in 2.1%, it was indicated, but not tolerated by the patients.
variables: sex, age, cardiovascular diseases under study (ischemic heart disease, CHF, and AF or atrial flutter), specialty (patient treated in cardiology/internal medicine) and various concomitant diseases (hypertension, diabetes mellitus, dyslipidemia, stroke, left ventricular hypertrophy, hepatic failure, second- or third-degree atrioventricular block, history of bronchospasm and bronchial asthma, bradycardia, hypotension, chronic obstructive pulmonary disease [COPD] and intermittent claudication). Multiple regression analysis was used to determine which variables were indepen- dently associated with BB use (Table 3). We entered in the model variables showing differences between using and not using BBs as well as variables with differences between internal medicine and cardiology to adjust for the various baseline characteristics of the patients in these two settings. We saw that as the age of the patient increased, the probability of being prescribed a BB decreased, and that the same was true for a history of respiratory conditions, bradycardia, and intermittent claudication. In contrast, if a patient with ischemic heart disease and/or a history of dyslipidemia, stroke, and/or left ventricular hypertrophy consulted in cardiology, the probability of receiving BB treatment increased. The Hosmer-Lemeshow test indicated that the regression model had satisfac- tory goodness-of-fit ($P= .8808$), i.e., the degree to which the predicted probability coincides with the observed probability. Lastly, the ROC curve obtained with the model showed good discrimination ($P=.758$).

**DISCUSSION**

BB use in Spain has improved over the past decade. Data from the Spanish registries PREVESE I and II (patients with acute myocardial infarction), 3C program (patients at discharge following an acute coronary syndrome), PRIAMHO (acute coronary syndrome with ST segment elevation), and DESCARTES (acute coronary syndrome without ST segment elevation) show BB use in 50% to 60% of patients with acute ischemic heart disease. Furthermore, in the more recent studies BB use is seen to increase, as shown in Table 4, which also includes data from the EUROASPIRE and TRECE registries. In the present study, we observed an increase in the use of these drugs for ischemic heart disease (more than 80% of patients) and for CHF (around 75%). The ischemic heart disease data are in line with the overall results from EUROASPIRE III (around 80%), in which the data were collected 2 years before those from the present study. The specific data for Spain, however, were lower (around 60%).

In the present study, we found differences in BB use according to the attending specialty (cardiology or internal medicine) and according to the setting (hospital discharge or outpatient treatment). Overall, BBs were used more in cardiology than in internal medicine, whether to treat ischemic heart disease, CHF, or AF. Although in AF the difference showed a trend similar to that of the other 2 disease groups, it did not reach statistical significance, likely because of the smaller number of patients included. The difference was, however, very evident in the treatment of heart failure, in which 64.2% of patients treated in internal medicine received BBs compared to 81.7% of those treated in cardiology, with both values being lower than the BB use reported in the recently published SHIFT study. A part of the treatment differences between specialties can be explained by the differing baseline characteristics of the patients treated in each of them. For example, the percentage of women was higher in internal medicine, and women received BBs less frequently than men. Nonetheless, patients treated in internal medicine had a higher prevalence of cardiovascular risk factors (older age and a higher prevalence of hypertension and diabetes) and more extracardiac manifestations of atherosclerotic disease (stroke and

---

**Figure 2.** Reasons why beta-blockers were not indicated in patients for whom their use was considered. AV, atrioventricular; COPD, chronic obstructive pulmonary disease.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Internal medicine</th>
<th>Cardiology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unfavorable social situation</td>
<td></td>
<td>34.9</td>
</tr>
<tr>
<td>Bronchial asthma</td>
<td>14.0</td>
<td>26</td>
</tr>
<tr>
<td>Bradycardia</td>
<td>9.20</td>
<td>30.2</td>
</tr>
<tr>
<td>COPD</td>
<td>15.8</td>
<td></td>
</tr>
<tr>
<td>Arterial disease</td>
<td>9.3</td>
<td></td>
</tr>
<tr>
<td>Diabetes</td>
<td>11.0</td>
<td></td>
</tr>
<tr>
<td>Depression</td>
<td>6.3</td>
<td></td>
</tr>
<tr>
<td>Muscle fatigue</td>
<td>9.3</td>
<td></td>
</tr>
<tr>
<td>AV block</td>
<td>4.7</td>
<td></td>
</tr>
<tr>
<td>Hypotension</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Cognitive deterioration</td>
<td>7.0</td>
<td></td>
</tr>
<tr>
<td>Erectile dysfunction</td>
<td>4.7</td>
<td></td>
</tr>
<tr>
<td>Difficulties with follow-up</td>
<td>4.7</td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>0.8</td>
<td></td>
</tr>
</tbody>
</table>

---

**Table 3.** Differences in the use of beta-blockers (BBs) according to selected variables.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Internal medicine</th>
<th>Cardiology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unfavorable social situation</td>
<td></td>
<td>34.9</td>
</tr>
<tr>
<td>Bronchial asthma</td>
<td>14.0</td>
<td>26</td>
</tr>
<tr>
<td>Bradycardia</td>
<td>9.20</td>
<td>30.2</td>
</tr>
<tr>
<td>COPD</td>
<td>15.8</td>
<td></td>
</tr>
<tr>
<td>Arterial disease</td>
<td>9.3</td>
<td></td>
</tr>
<tr>
<td>Diabetes</td>
<td>11.0</td>
<td></td>
</tr>
<tr>
<td>Depression</td>
<td>6.3</td>
<td></td>
</tr>
<tr>
<td>Muscle fatigue</td>
<td>9.3</td>
<td></td>
</tr>
<tr>
<td>AV block</td>
<td>4.7</td>
<td></td>
</tr>
<tr>
<td>Hypotension</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Cognitive deterioration</td>
<td>7.0</td>
<td></td>
</tr>
<tr>
<td>Erectile dysfunction</td>
<td>4.7</td>
<td></td>
</tr>
<tr>
<td>Difficulties with follow-up</td>
<td>4.7</td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>0.8</td>
<td></td>
</tr>
</tbody>
</table>
intermittent claudication); hence, one could infer the opposite: because they had a higher risk profile, internal medicine patients should show a greater prevalence of BB treatment than those in cardiology. As to the setting in which patients were treated, at discharge from hospital or on an outpatient basis, this factor had a smaller impact on BB prescription.

It was interesting to note that the reasons for not prescribing BBs differed between cardiology and internal medicine. One of the stated causes, “unfavorable social situation”, could be interpreted as an umbrella category that would encompass various conditions. It was found that cardiologists cite COPD more often than internal medicine specialists as a reason for not prescribing these drugs (38.6% vs 23.3%), whereas internists cite bradycardia more often (30.2% vs 14.2%). Furthermore, it is worthy of note that diabetes mellitus remains a reason for not indicating treatment in 11.6% of patients in internal medicine and 6.3% of those in cardiology. These differences may be explained by the type of disease: COPD is treated more commonly in internal medicine, whereas bradycardia is seen and treated more often in cardiology.

The matter in which there were significant differences between the two specialties was in the percentage of patients for whom BB treatment was not contemplated: 25.9% in cardiology and 37.4% in internal medicine, a statistically significant difference on which efforts should be focussed to improve daily clinical practice.

Multivariate analysis showed various areas in which the BB prescription rate can be improved. A series of variables that have been historically related to a “contraindication” for BB treatment (eg, respiratory disease or intermittent claudication) are now considered free of this contraindication (with the exception of respiratory disease with a potential for bronchospasm). Another variable, age, is a classic in interventional studies. In the present

Table 3

<table>
<thead>
<tr>
<th>Effect</th>
<th>OR (95% CI)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>8.3 (2.98-23.13)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Age, years</td>
<td>0.97 (0.96-0.98)</td>
<td>0.003</td>
</tr>
<tr>
<td>Ischemic heart disease</td>
<td>2.3 (1.6-3.31)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Follow-up by cardiology</td>
<td>1.7 (1.24-2.34)</td>
<td>0.01</td>
</tr>
<tr>
<td>Dyslipidemia</td>
<td>1.72 (1.28-2.3)</td>
<td>0.002</td>
</tr>
<tr>
<td>Stroke</td>
<td>1.64 (1.02-2.66)</td>
<td>0.041</td>
</tr>
<tr>
<td>Left ventricular hypertrophy</td>
<td>1.51 (1.13-2.03)</td>
<td>0.051</td>
</tr>
<tr>
<td>History of bronchospasm and bronchial asthma</td>
<td>0.22 (0.13-0.38)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Bradycardia</td>
<td>0.28 (0.15-0.54)</td>
<td>0.002</td>
</tr>
<tr>
<td>COPD</td>
<td>0.39 (0.26-0.6)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Intermittent claudication</td>
<td>0.35 (0.22-0.57)</td>
<td>&lt;.0001</td>
</tr>
</tbody>
</table>

Cl, confidence interval; COPD, chronic obstructive pulmonary disease; OR, odds ratio. Other variables entered in the model that were not statistically significant: diabetes mellitus, atrial fibrillation, hypertension, hypotension, heart failure, hepatic failure, and sex.

Table 4

<table>
<thead>
<tr>
<th>Year</th>
<th>PREVESE I11</th>
<th>EUROASPIRE I19,a</th>
<th>Programa 3C15</th>
<th>PREVESE II16</th>
<th>EUROASPIRE III20,a</th>
<th>EUROASPIRE III21,a</th>
<th>TREC22</th>
<th>CARACTER BETA2b</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients, n</td>
<td>1329</td>
<td>4863</td>
<td>3074</td>
<td>2054</td>
<td>5556</td>
<td>8966</td>
<td>2897</td>
<td>1582</td>
</tr>
<tr>
<td>Beta-blockers, %</td>
<td>33.3</td>
<td>53.7 (34.7)</td>
<td>37.4</td>
<td>45.1</td>
<td>63 (47)</td>
<td>80 (60)</td>
<td>64.5</td>
<td>80.4 (85.1)</td>
</tr>
</tbody>
</table>

a Between parentheses, data for Spain.
b Between parentheses, data for ischemic heart disease.
study, it was reaffirmed that as age increased, treatment decreased, in this case BBS, despite the published evidence on BB use in patients of advanced age.24

The limitations of this study are those inherent to any observational registry that does not allow a stratified adjustment of the patients. Furthermore, there is some selection bias related to nonrandomized recruitment of the participating medical specialists, as well as an unbalanced representation of acute phase (at discharge) and ambulatory patients included, which could detract from the external validity.

CONCLUSIONS

The data from this study show that the BB use for cardiovascular diseases in which treatment with these drugs is highly recommended by scientific societies has improved in Spain with respect to previous registries. Nevertheless, there are still significant differences between cardiology and internal medicine, even after adjusting for the baseline characteristics between patients treated in these two specialties. The reasons for not prescribing BBs differ between cardiologists and internal medicine specialists, and there remains a considerable number of patients in whom the use of these drugs is not contemplated even though there is a clear indication, particularly outside the cardiology setting. These data, the first obtained in a nationwide study, show that there is still room for improvement in BB prescription in Spain, in particular for patients with CHF or AF.

FUNDING

This project was funded by an unrestricted grant from Laboratorios Menarini S.A.

CONFLICTS OF INTERESTS

Antonio Zapata and Remei Artigas are employed in the Medical Department of Menarini, the laboratory that provided an unrestricted grant to carry out this study.

APPENDIX A. INVESTIGATORS PARTICIPATING IN THE FIRST PHASE OF THE CARACTER-BETA STUDY


REFERENCES