CLINICAL RESEARCH

First evaluation using a validated scale of the risk of congestive heart failure among hypertensive patients treated by general practitioners (O-PREDICT survey)

Première évaluation à partir d’une échelle validée du risque d’insuffisance cardiaque chez des patients hypertendus vus en médecine générale (enquête O-PREDICT)

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KEYWORDS
Hypertension; Heart failure; Risk factors

Summary

Background. — Routine management of hypertensive adults is based on assessment of risk factors for coronary artery disease; risk factors for heart failure (HF) remain poorly investigated despite the key role of hypertension in HF development.

Aim. — To assess the components of HF risk in hypertensive adults in primary care, compare physicians’ estimations of HF and global cardiovascular risks with established calculation algorithms, and assess the concordance of these algorithms.

Methods. — O-PREDICT was a transverse, observational, multicentre French survey conducted in 2006 among general practitioners who included the first hypertensive, non-HF patient seen in each of three age classes (< 60, 60—70, > 70 years). Estimations of HF and global cardiovascular

Abbreviations: BMI, Body mass index; BP, Blood pressure; GP, General practitioner; HF, Heart failure; SCORE, Systemic Coronary Risk Evaluation.

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Evaluation of the risk of congestive heart failure in hypertensive patients

Risks (at 4 and 10 years, respectively) were performed subjectively during the consultation and calculated a posteriori according to algorithms from the Framingham cohort and the European SCORE database, respectively. For each of these methods, patients were stratified into four risk categories (i.e., no, low, moderate, high).

**Results.** — One thousand five hundred and thirty seven physicians recruited 4523 patients (61% men; 64.5 ± 10.9 years; systolic blood pressure 149.9 ± 15.4 mmHg); most (67.2%) patients had one or two cardiovascular/HF risk factors (dyslipidaemia 48.8%, left ventricular hypertrophy 25.3%, diabetes 18.8%, coronary artery disease 8.8%, valvulopathy 6.1%); the number increased with advancing age and in men versus women. According to the Framingham algorithm, the risk of HF (mean 5.4 ± 8.5%; 13.4% of patients at high risk) increased with advancing age (p < 0.001), nearly doubling for each decade increase. According to the European SCORE system, global cardiovascular risk (mean 5.4 ± 4.3%) was moderate or elevated in 48.1% of patients. Concordance between physicians’ estimations and theoretical calculations for HF and global risks was poor, as was concordance between algorithms (κw = 0.28, 0.12, 0.11, respectively).

**Conclusion.** — More than one in 10 hypertensive patients seen in primary care is at high risk of HF at 4 years according to the Framingham model; this algorithm appears to offer additional information to that provided by the SCORE system. Physicians’ estimations of risks correlated poorly with algorithm calculations, suggesting that the use of these tools in general practice should be encouraged.

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**Résumé**

**Justification.** — La prise en charge des adultes hypertendus est généralement basée sur l’évaluation des facteurs de risque de coronaropathie, alors que les facteurs de risque d’insuffisance cardiaque (IC) restent peu évalués malgré le rôle crucial de l’hypertension artérielle dans le développement de l’IC.

**Objectifs.** — Évaluer les composantes du risque d’IC chez des patients hypertendus vus en médecine générale, et comparer les estimations par le médecin du risque d’IC et du risque cardiovasculaire global par rapport au risque calculé par des échelles validées, et enfin évaluer la concordance entre ces deux estimations.

**Méthode.** — O-PREDICT est une étude observationnelle, transversale, multicentrique conduite en France en 2006 chez des médecins généralistes qui devaient inclure le premier patient hypertendu sans IC vu en consultation au sein de trois tranches d’âge (< 60, 60—70, > 70 ans). Les estimations du risque d’IC et du risque cardiovasculaire global (à 4—10 ans, respectivement) étaient réalisées de façon subjective pendant la consultation et calculées a posteriori sur des algorithmes publiés basés sur la cohorte de Framingham et le SCORE Européen, respectivement. Pour chacune de ces trois méthodes, les patients étaient classés en quatre catégories de risque: (nul, faible, modéré ou élevé).

**Résultats.** — Mille cinq cent trente-sept médecins ont recruté 4523 patients (61% d’hommes; âge 64,5 ± 10,9 ans; pression artérielle systolique: 149,9 ± 15,4 mmHg), la majorité (67,2%) avec un ou deux facteurs de risque cardiovasculaire/IC [dyslipidémie (48,8%), hypertrophie ventriculaire gauche (25,3%), diabète (18,8%), coronaropathie (8,8%), valvulopathie (6,1%)], facteurs plus fréquents avec l’âge et chez les hommes. Selon l’algorithme de Framingham, le risque d’IC (moyenne 5,4 ± 8,5%; risque élevé chez 13,4% des patients) doublant presque pour chaque décennie d’âge (p < 0,001). Selon l’algorithme SCORE, le risque cardiovasculaire global (moyenne 5,4 ± 4,3%), était modéré ou élevé pour 48,2% des patients. Les concordances entre les estimations du médecin et les calculs des risques d’IC et cardiovasculaire global étaient mauvaises, de même que la concordance entre les deux algorithmes (κw = 0,28, 0,12 et 0,11, respectivement).

**Conclusion.** — Plus d’un patient hypertendu sur dix vus en médecine générale est à haut risque de développer une IC à quatre ans selon l’algorithme de Framingham, qui semble complémentaire de l’échelle SCORE. La corrélation entre les risques estimés par le médecin et les risques calculés restent faibles, ce qui devrait encourager à utiliser ces algorithmes en médecine générale.

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Background

The routine management of hypertensive adults is based on the assessment of risk factors for coronary artery disease [1,2] and on the concept of global cardiovascular risk. Concomitant intensive management of multiple risk factors has emerged as a useful approach for risk reduction [3–8]. Thus, the European Systematic Coronary Risk Evaluation (SCORE) system has been proposed to provide a numerical score related to different risk factors such as sex, age, smoking status, systolic blood pressure (BP), total cholesterol and diabetes, in order to stratify individual patients according to their 10-year risk for coronary artery disease mortality [9]. Recalibration of this algorithm is necessary in low-risk European populations, such as in France [10–12].

Recent American and European recommendations concerning the management of chronic heart failure (HF) have highlighted high BP as one of the main precipitating factors [13,14]. These guidelines have also identified a group of at-risk patients without clinically evident disease or structural cardiac abnormalities, but with classic risk factors for HF, who should form an important focus for modern healthcare policies. It remains that HF risk factors, particularly in hypertensive patients, are poorly investigated in current clinical practice despite the key role of hypertension in HF development. An analysis from the Framingham cohort has shown that identification of patients at high risk of developing HF within 4 years is possible using a calculation algorithm, which takes into account risk factors for HF including arterial pressure [15]. However, these validated tools are not currently used in clinical practice, and both HF and cardiovascular risks appear to be underestimated, particularly in patients at highest risk [16].

Thus, the aims of the Observatoire de la prise en charge et de l’évaluation du risque d’insuffisance cardiaque chez les patients hypertendus (O-PREDICT) survey, conducted by French general practitioners (GPs) during routine practice, were to assess the components of HF risk in hypertensive adults in primary care and to compare physicians’ estimations of HF and global cardiovascular risks with those from established algorithms.

Methods

The O-PREDICT survey was a transverse, observational, multicentre survey conducted by GPs in France from March 2006 to July 2006. Each GP included the first adult (age ≥ 18 years) hypertensive, non-HF patient seen in each of three age classes (< 60, 60–70, > 70 years). Hypertension was defined as systolic BP ≥ 140 mmHg and/or diastolic BP ≥ 90 mmHg or treated hypertension.

The primary study objective was to assess the incidence of each component of HF risk in hypertensive patients free of HF in primary care. Secondary objectives were to calculate the 4-year risk of HF according to the Framingham cohort [15] and the 10-year global cardiovascular risk using the European SCORE system [17], and then to compare the physicians’ estimations done during the GP visit with these calculations performed a posteriori. The concordance between both risk calculations was analysed.

Data collection and risk estimations

A questionnaire was completed by the physician for each patient, which collected clinical information, medical and cardiovascular history, cardiovascular risk factors defined by the French Haute Autorité de santé [18], clinical symptoms, outpatient and ambulatory BP measurements when available, complementary investigations, and BP history. Based on these data, GPs estimated the 4-year HF risk and the 10-year global cardiovascular risk level for each patient as no risk, low, moderate or high risk.

Risk calculations

Both risks were then calculated a posteriori from the final database, using algorithms for men and women, and for each age category, to be crossed with the physicians’ estimations. The 4-year HF risk was calculated based on the predisposing conditions from the Framingham cohort [15] (i.e., age, systolic BP, heart rate, electrocardiographic and/or echocardiographic left ventricular hypertrophy, body mass index [BMI], coronary artery disease, valvulopathy and diabetes). The 10-year global cardiovascular risk was calculated according to the European SCORE system, based on sex, age, smoking status, systolic BP and cholesterol concentration [17]. Patients were stratified consecutively into four levels of risk: no risk (≤ 1%), low (2–4%), moderate (5–9%) and high (≥ 10%) risk for HF at 4 years, and no risk (≤ 1%), low (2–4%), moderate (5–14%) and high (≥ 15%) risk for global cardiovascular risk at 10 years.

Concordance between HF and cardiovascular risk calculations

To analyse concordance between the Framingham HF risk model and the SCORE system, the following risk categories were used: ≤ 1%, 2–4%, 5–9%, 10–14% and ≥ 15%.

Statistical analysis

The assessment was done for the whole population as well for each sex and within age categories. Based on an expected minimal percentage of 4% of patients presenting with a cardiovascular factor included in the HF risk assessment and a survey accuracy fixed to 1.5%, the number of patients needed in each group was estimated to be 656 (i.e., 1640 patients in each age group for an expected maximal sex ratio of 1.5), with a total of 4920 patients for the survey [19]. Descriptive statistics were mean, standard deviation, minimum, maximum and median values for quantitative parameters, and frequency and percentage for qualitative parameters. Between-group comparisons were made using the t-test for continuous variables and the Chi-square test for categorical variables. Multivariable regression analyses were used to assess the independent prognostic value of variables in Cox models and results are expressed as odds ratios with 95% confidence intervals; hence, concordance between the GPs’ estimates of risk and the calculated levels according to the Framingham or the SCORE system was evaluated using weighted kappa ($\kappa_w$). To interpret the kappa ratings, benchmarks were used as suggested by Landis and Koch [20]. All tests were bilateral with a $\alpha$ risk equal to
Table 1  Patient characteristics.

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Men</th>
<th>Women</th>
<th>p^a</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients, n (%)</td>
<td>4523</td>
<td>2765 (61.1)</td>
<td>1758 (38.9)</td>
<td></td>
</tr>
<tr>
<td>Age in years^b, n (%)</td>
<td>64.5 ± 10.9</td>
<td>—</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>&lt; 60</td>
<td>1527 (33.8)</td>
<td>1059 (38.3)</td>
<td>468 (26.6)</td>
<td>ND</td>
</tr>
<tr>
<td>60–70</td>
<td>1531 (33.9)</td>
<td>900 (32.5)</td>
<td>631 (35.9)</td>
<td>ND</td>
</tr>
<tr>
<td>&gt; 70</td>
<td>1465 (32.4)</td>
<td>806 (29.2)</td>
<td>659 (37.5)</td>
<td>ND</td>
</tr>
<tr>
<td>Systolic BP^b (mmHg)</td>
<td>149.9 ± 15.4</td>
<td>150.3 ± 15.0</td>
<td>149.4 ± 15.8</td>
<td>0.032</td>
</tr>
<tr>
<td>Diastolic BP (mmHg)</td>
<td>86.8 ± 10.2</td>
<td>87.3 ± 10.1</td>
<td>85.9 ± 10.2</td>
<td>ND</td>
</tr>
<tr>
<td>Heart rate^b (beats/minute)</td>
<td>74.9 ± 9.0</td>
<td>74.8 ± 9.1</td>
<td>75.0 ± 8.7</td>
<td>0.39</td>
</tr>
<tr>
<td>BPM^b (kg/m^2)</td>
<td>27.7 ± 4.6</td>
<td>27.9 ± 4.1</td>
<td>27.5 ± 5.3</td>
<td>0.006</td>
</tr>
<tr>
<td>BMI &gt; 30 kg/m^2, n (%)</td>
<td>1104 (24.8)</td>
<td>662 (24.4)</td>
<td>442 (25.6)</td>
<td>ND</td>
</tr>
<tr>
<td>Total cholesterol (g/L)</td>
<td>2.2 ± 0.4</td>
<td>2.2 ± 0.4</td>
<td>2.2 ± 0.4</td>
<td>ND</td>
</tr>
<tr>
<td>High-density lipoprotein cholesterol (g/L)</td>
<td>0.6 ± 0.2</td>
<td>0.6 ± 0.2</td>
<td>0.6 ± 0.2</td>
<td>ND</td>
</tr>
<tr>
<td>Dyslipidaemia, n (%)</td>
<td>2063 (48.8)</td>
<td>1312 (50.8)</td>
<td>751 (45.8)</td>
<td>ND</td>
</tr>
<tr>
<td>Sedentary lifestyle, n (%)</td>
<td>2909 (64.0)</td>
<td>1695 (60.1)</td>
<td>1214 (68.7)</td>
<td>ND</td>
</tr>
<tr>
<td>Alcohol misuse, n (%)</td>
<td>956 (21.3)</td>
<td>852 (31.1)</td>
<td>104 (6.0)</td>
<td>ND</td>
</tr>
<tr>
<td>Diabetes^a, n (%)</td>
<td>842 (18.8)</td>
<td>542 (19.7)</td>
<td>300 (17.2)</td>
<td>0.0026</td>
</tr>
<tr>
<td>Left ventricular hypertrophy^b,c, n (%)</td>
<td>816 (25.3)</td>
<td>535 (26.6)</td>
<td>281 (23.3)</td>
<td>0.004</td>
</tr>
<tr>
<td>Coronary artery disease^b, n (%)</td>
<td>392 (8.8)</td>
<td>301 (11.1)</td>
<td>91 (5.25)</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Heart valve disease^b, n (%)</td>
<td>270 (6.1)</td>
<td>162 (6.0)</td>
<td>108 (6.3)</td>
<td>0.41</td>
</tr>
<tr>
<td>Symptoms/abnormal signs, n (%)</td>
<td>1710 (38.2)</td>
<td>997 (36.4)</td>
<td>713 (41.0)</td>
<td>ND</td>
</tr>
<tr>
<td>Exertion dyspnoea</td>
<td>1118 (65.4)</td>
<td>635 (63.7)</td>
<td>483 (67.7)</td>
<td>ND</td>
</tr>
<tr>
<td>Lower limb edema</td>
<td>447 (26.1)</td>
<td>234 (23.5)</td>
<td>213 (29.9)</td>
<td>ND</td>
</tr>
<tr>
<td>Cardiac murmur</td>
<td>271 (15.9)</td>
<td>171 (17.2)</td>
<td>100 (14.0)</td>
<td>ND</td>
</tr>
<tr>
<td>Palpitations</td>
<td>223 (13.0)</td>
<td>148 (14.8)</td>
<td>75 (10.5)</td>
<td>ND</td>
</tr>
<tr>
<td>Sleep apnoea syndrome</td>
<td>214 (12.5)</td>
<td>181 (18.2)</td>
<td>33 (4.6)</td>
<td>ND</td>
</tr>
</tbody>
</table>

Data expressed as mean ± standard deviation except where indicated. BMI: body mass index; BP: blood pressure; LVH: left ventricular hypertrophy; ND: not done.

^a For men vs women.

^b Components of heart failure risk.

^c On electrocardiogram and/or echocardiograph.

0.05. Statistical analysis was performed using SAS® software, version 8.2 (SAS Institute Inc, Cary, NC, USA).

Results

Study-group characteristics

A total of 1537 GPs from all metropolitan areas in France participated in the O-PREDICT survey. Of the 4585 recruited patients, 62 (1.4%) were excluded from the analysis due to major deviations such as missing age (n = 42) and sex (n = 19), or normal BP and no antihypertensive treatment (n = 2). Consequently, 4523 hypertensive adult patients with a mean age of 65 ± 11 years formed the study group. The characteristics of these patients are shown in Table 1. Sex distribution was similar across the three age groups.

The time since diagnosis of hypertension was described as recent (new diagnosis or within past year) (20.3%, n = 917), between 1 and 10 years (59%, n = 2658) and > 10 years (20.7%, n = 932). Women (23.5% vs 18.9% in men) and patients older than 70 years (39.3%) were more likely to have been diagnosed with hypertension more than 10 years earlier.

Lifestyle considerations revealed current smoking in 19.4%, alcohol misuse in 21.3% and sedentary behaviour in 64.0% of patients. Obesity (BMI > 30 kg/m^2) was reported in 26.6% of patients aged < 60 years and in 28.2% between 60 and 70 years of age, but in only 19.8% of patients > 70 years.

Compared to women, men presented with higher systolic BP and BMI, and more often with left ventricular hypertrophy, coronary artery disease or diabetes. Compared to younger patients, older patients (> 70 years) presented with higher systolic BP (p = 0.057), BMI (p < 0.0001) and more frequently with left ventricular hypertrophy, coronary artery disease, cardiac valve disease or diabetes (p < 0.0001 for each). In men > 50 years of age (93.6%; n = 2498) and women > 60 years (75.8%; n = 1287), most patients (67.2%; n = 3037) presented one or two risk factors and 19.5% (n = 883) with three risk factors, including family history of coronary artery disease (25.7%; n = 1150), current smoking (19.4%; n = 867), diabetes (18.8%; n = 842) and dyslipidaemia (48.8%; n = 2063), while only 6.0% (n = 272) presented no cardiovascular risk factors. Beyond 70 years of age, the prevalence of diabetes, dyslipidaemia and family history of coronary artery disease tended to decrease while the rate of systolic hypertension increased. The number of risk factors increased
Table 2  Calculated heart failure risk at 4 years according to the Framingham algorithm [15] in men and women and within each age class.

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Men (n = 1856)</th>
<th>Women (n = 983)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 60</td>
<td>2.4 ± 2.9</td>
<td>2.0 ± 1.9</td>
</tr>
<tr>
<td>60—70</td>
<td>4.4 ± 5.6</td>
<td>5.0 ± 8.6</td>
</tr>
<tr>
<td>&gt; 70</td>
<td>8.6 ± 10.2</td>
<td>8.9 ± 12.6</td>
</tr>
</tbody>
</table>

Data given as mean ± SD.

significantly in patients with left ventricular hypertrophy (p < 0.001).

Coronary artery disease was reported in 8.8% of patients (previous myocardial infarction in 202 patients and/or coronary revascularization in 201 patients). Peripheral arteriopathy was reported in 8.9% (n = 394), heart valve disease in 6.1% (n = 270), renal dysfunction in 4.7% (n = 209) and previous stroke in 3.4% (n = 163). Cardiovascular drugs (mean 2.3 ± 1.4) were taken by 88.5% patients (n = 3994).

Heart failure risk

Physician estimation

The risk of developing HF over 4 years was estimated by the GPs to be none in 6.3% (n = 281), low in 36.8% (n = 1651), moderate in 37.3% (n = 1673) and high in 19.7% (n = 882) of patients. The incidence of moderate or high risk increased with advancing age (Table 2 and Fig. 1), and was higher in men compared with women (61.2% vs 50.2%, respectively).

Theoretical calculation

The risk of developing HF over 4 years was evaluated in 2839 (62.8%) patients and reached a mean of 5.4 ± 8.5% (corresponding score 10.9 ± 5.3 points). The risk increased significantly with age (p < 0.001), nearly doubling for each decade increase (Table 2). When considering categorical risk levels, 11.5% of patients (n = 325) were considered as having no risk, 61.1% (n = 1734) as at low risk, 14.1% (n = 399) at moderate risk and 13.4% (n = 381) at high risk. The rates of moderate and high risk increased with age, reaching 3.2%<60 years, 10.3% between 60 and 70 years, and 24.3%>70 years of age. The estimated incidence of moderate or high risk rose with advancing age and was higher in men versus women (Fig. 1).

Comparison of calculated and estimated risks

Concordance between the estimated and calculated risks was poor (40.6%; κw = 0.28) (Table 3), irrespective of the presence or absence of symptoms (41.1% for the 1197 symptomatic patients versus 40.1% for the 1616 asymptomatic subjects). Physicians tended to overestimate the risk of developing HF, irrespective of the patient’s sex and age; the risk of overestimation was by one step in 37.8% (n = 1067) and by two steps in 11.2% (n = 316) of patients. Concordant estimations were more frequent in women (46.2%; n = 453) than in men (37.6%; n = 694), and increased with age (32.1% [n = 261] <60 years, 42.0% [n = 477] between 60 and 70 years and 46.0% (n = 477) >70 years).

Global cardiovascular risk

Physician estimation

The global cardiovascular risk was estimated to be none in 1.3% (n = 58), low in 23.4% (n = 1044), moderate in 41.2% (n = 1841) and high in 34.2% (n = 1529) of patients. The prevalence of high-risk patients increased with age (26.9—41.7%) and was higher in men than in women (38.6% vs 27.2%).

Theoretical calculation

Of the 4523 participants, it was possible to calculate the global cardiovascular SCORE risk in 3341 (73.9%) patients. The mean score was 5.4 ± 4.3. When considering categorical risk levels (Table 4), 11.1% (n = 367) of patients were considered as no risk, 40.8% (n = 1351) as low risk, 43.8%
Table 3  Concordance between risk of heart failure at 4 years estimated by general practitioners or calculated according to the Framingham algorithm [15]. The number of patients concerned (percentage of overall population) is given for each category of heart failure risk ($\kappa_w = 0.28$).

<table>
<thead>
<tr>
<th>Estimated</th>
<th>No risk</th>
<th>Low risk</th>
<th>Moderate risk</th>
<th>High risk</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calculated</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No risk</td>
<td>62 (2.2)</td>
<td>69 (2.4)</td>
<td>2 (0.1)</td>
<td>0 (0)</td>
<td>133 (4.7)</td>
</tr>
<tr>
<td>Low risk</td>
<td>173 (6.1)</td>
<td>668 (23.7)</td>
<td>77 (2.7)</td>
<td>16 (0.6)</td>
<td>934 (33.1)</td>
</tr>
<tr>
<td>Moderate risk</td>
<td>66 (2.3)</td>
<td>742 (26.3)</td>
<td>166 (5.9)</td>
<td>111 (3.9)</td>
<td>1085 (38.4)</td>
</tr>
<tr>
<td>High risk</td>
<td>20 (0.7)</td>
<td>250 (8.9)</td>
<td>152 (5.4)</td>
<td>251 (8.9)</td>
<td>673 (23.8)</td>
</tr>
<tr>
<td>Total</td>
<td>321 (11.3)</td>
<td>1729 (61.2)</td>
<td>397 (14.1)</td>
<td>378 (13.4)</td>
<td>2825 (100)</td>
</tr>
</tbody>
</table>

Table 4  Concordance between cardiovascular risk at 10 years estimated by the general practitioners and calculated according to the global cardiovascular SCORE system [17]. The number of patients concerned (percentage of overall population) is given for each category of heart failure risk ($\kappa_w = 0.11$).

<table>
<thead>
<tr>
<th>Estimated</th>
<th>No risk</th>
<th>Low risk</th>
<th>Moderate risk</th>
<th>High risk</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calculated</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No risk</td>
<td>20 (0.6)</td>
<td>153 (4.7)</td>
<td>133 (4.0)</td>
<td>61 (1.8)</td>
<td>367 (11.1)</td>
</tr>
<tr>
<td>Low risk</td>
<td>19 (0.6)</td>
<td>335 (10.1)</td>
<td>587 (17.7)</td>
<td>410 (12.4)</td>
<td>1351 (40.8)</td>
</tr>
<tr>
<td>Moderate risk</td>
<td>3 (0.1)</td>
<td>229 (6.9)</td>
<td>582 (17.6)</td>
<td>635 (19.2)</td>
<td>1449 (43.8)</td>
</tr>
<tr>
<td>High risk</td>
<td>0 (0)</td>
<td>7 (0.2)</td>
<td>53 (1.6)</td>
<td>84 (2.5)</td>
<td>144 (4.3)</td>
</tr>
<tr>
<td>Total</td>
<td>42 (1.3)</td>
<td>724 (21.9)</td>
<td>1355 (40.9)</td>
<td>1190 (35.9)</td>
<td>3311 (100)</td>
</tr>
</tbody>
</table>

Comparison of calculated and estimated risks

Concordance between the estimated and calculated risks was mild (30.8%; $\kappa_w = 0.11$; Table 4). GPs tended to underestimate the no risk and low risk categories and to overestimate the high risk in both men and in women. Overall, 41.5% (n = 1375) of patients had their risk overestimated by one step, 16.4% (n = 543) by two steps and 1.8% (n = 61) by three steps. Finally, 35.5% (n = 707) of men but only 23.8% (n = 314) of women had concordant risk grades. Concordance was not influenced by the presence or absence of symptoms.

Concordance between calculated HF and global risks

The 4-year HF risk and the 10-year global cardiovascular risk were compared among 2207 eligible observations. Only 749 individuals were classified in equivalent risk groups. The overall concordance was low (33.9%; $\kappa_w = 0.12$) irrespective of the presence (30.6%, $\kappa_w = 0.08$) or absence (36.4%, $\kappa_w = 0.10$) of symptoms. In 45.9% (n = 1013) of patients, the global cardiovascular risk exceeded the Framingham HF risk (Fig. 2).

Discussion

O-PREDICT is the first survey to describe two concomitant approaches to HF and global cardiovascular risk assessment in hypertensive adults by general practitioners in primary care. The physicians sampling and the patients’ chronological selection bring a noteworthy guarantee of representativity, as well as the balanced distribution of patients.
in the three age groups. The analysis of the primary endpoint shows that HF risk components were more frequent in men and in older patients. Moreover, practitioners estimated that 57% of hypertensive patients presented with a moderate or a high risk of developing HF within 4 years. This risk remains critical in this hypertensive population in primary care, as more than 13% presented with a high risk (≥10%), especially subjects older than 70 years. Given that the accurate assessment of global cardiovascular risk is essential for the optimal management of hypertensive adults, careful attention to multiple identified risk factors [19] is required in addition to any element of HF. In our work, most hypertensive patients (67.2%) presented with one or two cardiovascular risk factors. The number of cardiovascular risk factors increased with age and the presence of left ventricular hypertrophy (p < 0.001), while more than 50% of patients presented with associated risk factors.

The concordance between the estimated and the calculated Framingham HF risk was fair according to the considered level of risk, with physicians tending to overestimate low-risk patients but to underestimate high-risk patients, whatever their age or sex. Interestingly, this subjective classification was not influenced by the presence of symptoms and the high-risk rate increased by almost 10% with age.

Similarly, the concordance between both approaches for global cardiovascular risk (according to the SCORE system) was poor: 48% of subjects had a moderate or high calculated global cardiovascular risk, while physicians attributed a moderate to high risk to 75% of their patients, hence overestimating the risks. A UK study [21] focused on the global cardiovascular risk assessed in 397 hypertensive patients aged between 60 and 79 years by GPs and practice nurses, using Framingham-based tables; the study revealed that the level of risk was estimated correctly in only 21% of patients, and was underestimated in 63%, without any systematic difference between estimates made by GPs and nurses.

Finally, the risk of developing HF over the next 4 years, calculated according to the Framingham cohort, tallied rarely with the 10-year global cardiovascular risk, calculated according to the SCORE system, but this discrepancy could be due to the fact that the Framingham algorithm quantifies individual HF risk over the next 4 years, while the SCORE system predicts global coronary fatal events. These findings highlight the need for GPs to use both tools in order to determine accurately an individual patient’s risk level.

**Conclusion**

Although the Framingham HF risk algorithm and the SCORE system have been available for many years, they are used rarely in routine clinical practice, particularly in hypertensive patients, who are at high global cardiovascular and HF risk. Our study shows that more than one in 10 hypertensive patients seen in primary care is at high risk of HF according to the Framingham algorithm. This algorithm appears to offer additional information to that provided by the SCORE system. When combined with the fact that GPs’ estimates of global cardiovascular and HF risk correlate poorly with estimated risks, the use of such validated tools in routine practice is to be encouraged.

**Conflict of interest**

Consultant for AstraZeneca France.

**References**


