Predictive Value of the Framingham Risk Score in Identifying High Cardiovascular Risk

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Abstract

Background: Cardiovascular risk stratification is essential for an adequate approach to primary prevention. However, the current risk scores have no satisfactory accuracy in predicting cardiovascular events.

Objective: To evaluate whether the two risk scores recommended by the major cardiology societies have predictive value in identifying patients with an established high cardiovascular risk.

Methods: The study included 72 patients classified as high risk based on independent factors as recommended by the Brazilian Society of Cardiology. At the first appointment, the Framingham score and the SCORE risk were calculated in order to evaluate the ability to identify high-risk individuals.

Results: Of 72 patients, 39 (53.4%) patients were male with a mean age of 59.0±9.5 years, mean 129.0±22 mmHg and 78.0±14 mmHg systolic and diastolic blood pressure, respectively. In the sample, 91.8% were hypertensive, 46.5% had diabetes, 36.9% were current smokers and 72.6% were patients with coronary artery disease, of which 56.1% had previous myocardial infarction. Among these patients, 32 (44.4%) were considered at low cardiovascular risk, 27 (37.5%) intermediate-risk and 13 (18.1%) high-risk by the Framingham score; and 26 (36.1%) patients were considered at high risk by the SCORE risk.

Conclusion: Based on the high-risk population, neither the Framingham score nor the SCORE risk were considered good identifiers of patients at high cardiovascular risk.

Keywords: Cardiovascular diseases; Risk factors; Diabetes mellitus; Dyslipidemias; Smoking; Atherosclerosis

Introduction

As the population ages, the prevalence of cardiovascular diseases has increased in recent years. The prevention of acute cardiovascular event is the main concern of doctors for primary prevention¹.

Cardiovascular risk stratification is a fundamental part in the initial clinical evaluation of the patient. There are several risk scores, including the Framingham score, SCORE, PROCAM and Reynolds. The one currently recommended by the Brazilian Society of Cardiology (SBC) is the Framingham score²⁻⁵.

The Framingham score, based on clinical and laboratory variables, evaluates cardiovascular risk in 10 years and classifies patients into low, medium and high risk. However, SBC recommends identifying aggravating factors for the reclassification of patients in order to restrategy them more accurately¹²⁻⁶.

The European Society of Cardiology (ESC), in its guidelines on prevention, recommends using the SCORE risk for determining the cardiovascular risk of patients and, with it, the determination of therapeutic goals⁷.
However, it is known that both the Framingham score and SCORE present limitations in the actual identification of high cardiovascular risk patients. It is often necessary to reclassify this risk using markers from complementary tests.

The objective of this study is to evaluate the predictive value of the Framingham isolated score and SCORE risk to identify high cardiovascular risk in patients known to be at high risk.

**Methods**

A retrospective study that included the analysis of 144 records of patients treated in the medical residency outpatient facility in cardiology at Instituto Estadual de Cardiologia Aloysio de Castro, RJ, in 2011. This study is part of a research project approved by the Ethics Committee of the institution under no. 02391712.80000.5265

Of the total, 72 patients were considered at high risk based on the presence of diagnosed coronary artery disease, vascular disease and diabetes mellitus.

The diagnosis of coronary artery disease was defined as history of acute myocardial infarction or angiographic evidence of coronary artery disease. For diagnosing diabetes mellitus, it was necessary to obtain two measurements of fasting plasma glucose levels >126 mg/dL in different samples or using oral hypoglycemic agents.

The Framingham score was calculated using the following variables: age, sex, systolic blood pressure, treatment of hypertension, total cholesterol, HDL cholesterol and current smoking.

The classification of cardiovascular risk by the Framingham score is thus determined: low, if risk <10% in 10 years; intermediate, between 10-20% and high if >20%. By the SCORE risk, patients are considered at high cardiovascular risk when >5%.

In the statistical analysis, continuous variables were expressed as mean and standard deviation and dichotomic variables were expressed in absolute and relative frequency. The statistical software Statistica 8 of StatSoft, Tucson, Texas was used.

**Results**

Of the 144 patients, 72 patients at high cardiovascular risk were separated: 39 (53.4%) were male, mean age 59.0±9.5 years. Among the cardiovascular risk factors, systemic hypertension was the most prevalent with 91.8%, followed by diabetes mellitus (46.5%) and current smoking (36.9%) (Table 1).

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Characteristics of the population studied</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>53.4</td>
</tr>
<tr>
<td>Age (years) (mean ± SD)</td>
<td>59.0±9.5</td>
</tr>
<tr>
<td>Systolic blood pressure (mmHg) (mean ± SD)</td>
<td>129.0±22</td>
</tr>
<tr>
<td>Diastolic blood pressure (mmHg) (mean ± SD)</td>
<td>78.0±14</td>
</tr>
<tr>
<td>SH</td>
<td>91.8%</td>
</tr>
<tr>
<td>DM</td>
<td>46.5%</td>
</tr>
<tr>
<td>Current smoking</td>
<td>36.9%</td>
</tr>
<tr>
<td>CAD</td>
<td>72.6%</td>
</tr>
<tr>
<td>Previous AMI</td>
<td>56.1%</td>
</tr>
<tr>
<td>Total cholesterol (mg/dL) (mean ± SD)</td>
<td>187.0±59</td>
</tr>
<tr>
<td>HDL (mg/dL) (mean ± SD)</td>
<td>43.0±11</td>
</tr>
<tr>
<td>LDL (mg/dL) (mean ± SD)</td>
<td>110.0±41</td>
</tr>
<tr>
<td>Triglycerides (mg/dL) (mean ± SD)</td>
<td>187.0±117</td>
</tr>
<tr>
<td>Low risk Framingham score</td>
<td>44.4%</td>
</tr>
<tr>
<td>Intermediate risk Framingham score</td>
<td>37.5%</td>
</tr>
<tr>
<td>High risk Framingham score</td>
<td>18.1%</td>
</tr>
<tr>
<td>High risk SCORE</td>
<td>36.1%</td>
</tr>
</tbody>
</table>

SH - systemic hypertension; DM - diabetes mellitus; CAD - coronary artery disease; AMI - acute myocardial infarction; HDL - high-density lipoprotein; LDL - low density lipoprotein; SD - standard deviation

Patients had a mean of 129.0±22.0 mmHg and 78.0±14.0 mmHg systolic and diastolic blood pressure, respectively. Regarding the lipid variables, the patients presented: total cholesterol 187.0±59.0 mg/dL; HDL 43.0±11.0 mg/dL; LDL 110.0±41.0 mg/dL; and triglycerides 187.0±117.0 mg/dL.
In the identification of cardiovascular risk by Framingham score, 32 (44.4%) patients were classified as low cardiovascular risk (probability of events <10%), 27 (37.5%) of intermediate risk (10-20%) and 13 (18.1%) of high risk (Figure 1).

**Figure 1** Percentage of patients stratified by cardiovascular risk calculated by the Framingham score.

In the risk prediction analysis, the isolated Framingham score identified only 18.1% of high-risk patients, and of the remaining 81.9%, 44.4% were erroneously stratified as low risk.

Regarding the patients assessed by SCORE risk, 26 (36.1%) patients were considered at high risk; when both associated scores were evaluated, of 72 patients, only 29 (40.3%) patients had high-risk criteria for at least one risk score (Figure 2).

**Figure 2** Percentage of patients stratified by cardiovascular risk calculated by the SCORE risk.

**Discussion**

The stratification of cardiovascular risk is the main clinical tool for the prevention of cardiovascular events and is recommended at the first appointment.

The Framingham score is the most widely used and recommended by the American Heart Association (AHA) and SBC, while the SCORE risk is recommended by ESC. Both use risk clinical variables such as age and blood pressure; and laboratory variables such as cholesterol total level to predict cardiovascular risk.

Due to the limitation of these scores in reliably identifying the cardiovascular risk of patients, there are laboratory and complementary imaging variables that reclassify the patients in a greater degree of cardiovascular risk, such as creatinine >1.5 mg/dL, the presence of left ventricular hypertrophy on electrocardiogram, calcium score >100, increased intima-media thickness and microalbuminuria.

Some studies have shown that the Framingham score has some failures in identifying patients susceptible to cardiovascular events even because they do not use the treatment of hypercholesterolemia as a variable, since many patients come to the office under use of statins for primary prevention.

Carotid Doppler in asymptomatic patients classified by the Framingham as low risk showed that 38.0% had ultrasound aspects of high risk, either due to increased intima-media thickness or due to the presence of carotid plaques. Another study showed that 59.0% of patients classified as low risk by the Framingham score had plaque identifiable by carotid Doppler.

The use of reclassifiers such as C-reactive protein, HDL, HbA1C, coronary calcium score and intima-media thickness leads to identification of increased risk in patients previously substratified.

In a recently published study, 33.8% and 40.4% of patients classified as low risk by the Framingham score and SCORE risk, respectively, had evidence of coronary atherosclerotic plaque identified by angiography, emphasizing that, in this population, the patients were symptomatic.

It should be noted that the Framingham score outcomes include acute myocardial infarction (AMI) and death.
from coronary heart disease; and in the SCORE risk, it only includes death from coronary heart disease. Some of the patients were already under use of statins and antihypertensive drugs for secondary prevention, which could underestimate the risk in some patients, but not so significantly.

**Conclusion**

In the population studied, which is already determined as of high cardiovascular risk, the Framingham score was not enough to properly identify individuals, and the SCORE risk assessment associated has slightly increased the identification of these patients.

**Potential Conflicts of Interest**

No relevant conflicts of interest.

**Sources of Funding**

This study had no external funding sources.

**Academic Association**

This study is not associated to any graduate programs.

**References**


