CV RISK – A new relative cardiovascular risk score

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ABSTRACT

Background and aims: Nowadays it is recommended to use risk scores to evaluate the magnitude of cardiovascular risk in healthy people, most popular being SCORE (Europe) and Framingham and ASCVD (US). Unfortunately, they are not enough motivating in young and old population, don’t consider protective factors and cannot be used in cardiovascular patients always included in very high risk category. To improve the evaluation everytime of individual cardiovascular risk we described a new score – CVRISK (cardiovascular relative individual risk).

Methods: It uses 15 items and can be used also in cardiovascular patients. The first seven items are clinical – age and gender, heredity, smoking, hypertension, obesity, psychosocial stress, previous cardiovascular disease. For items refer to laboratory data – LDL-C, HDL-C, TG, fasting plasma glucose (diabetes mellitus). The last two are protective factors – physical activity and healthy diet.

Results: Every item has a number of risk points and protective factors decrease with 25% and 15% the calculated risk. The risk can be automatically calculated after the introduction of the required data through an algorithm available at www.cvrisk.ro. Here, the calculated risk is compared with optimal and maximal risk. Thus the user is motivated to initiate or to continue preventive measures also suggested at www.cvrisk.ro, to improve cardiovascular health.

Conclusion: CVRISK is not a substitute of current risk scores, but a complimentary tool to appreciate and modulate the individual cardiovascular risk. It can be useful to prevent CV disease or to improve its evolution. Individuals themselves can calculate it in order to maintain or improve their health.

Background

Nowadays, it is definitely well recognized that degenerative cardiovascular disease, mainly atherosclerosis, depends on unmodifiable and modifiable risk factors [1,2].

Risk scores, mainly SCORE (Europe) [1,3], Framingham [4] and ASCVD (US) [5,6], are used to evaluate the magnitude of cardiovascular (CV) risk.

According to these scores, subjects are included in low, moderate, high and very high-risk categories [1,7] and several preventive measures are recommended to reduce CV risk factors.

CV patients are always in the very high-risk category, while diabetes mellitus and chronic kidney disease are also known to increase CV risk.

The INTERHEART study [8] has proved that atherosclerosis and ischemic heart disease depend, in all geographical regions, on the same risk factors. Different prevalence of ischemic heart disease results from different prevalence of risk factors. The study has identified six main risk factors (RF), namely high cholesterol (apoB/apoA ratio), smoking, hypertension (HTN), obesity, diabetes mellitus, psychosocial stress. It has also identified three protective factors: rich fruits and vegetables diet (Mediterranean), physical activity and moderate alcohol consumption.

All CV risk scores have however a few limitations.

They don’t consider the population under 30 and no difference is made in the population over 65 years [1,4]. Also, obesity and psychosocial stress are not included in the calculation of the risk [1,4].

The protective factors are not included in these scores, even if they can decrease significantly the incidence and prevalence of ischemic heart disease [1,3–5].

That’s why the absolute risk scores (SCORE, Framingham, ASCVD) are not motivating for young and old people. For example, in a subject 75 years old, a ten years risk of 15% (very high) to die by CV disease) means not much, because general mortality in the same period is much higher.

To be noted that all in use scores cannot be applied in CV patients, because they are already in the very high-risk category [1,3–5].

Therefore, the patients are not motivated to submit secondary preventive measures.

It would be necessary to have a CV risk score which considers all main risk factors and protective ones, and that could also be used in
young and old population, as well as in CV patients. The option to evaluate CV risk even when laboratory data are not available would increase the popularity and usefulness of such a score.

More people would feel more motivated to apply preventive measures by a score that would allow to gage in evolution, the relative risk to develop a CV disease.

Of course such a score, if not validated through population studies, can be considered more a tool to evaluate ideal cardiovascular health [9,10] than a true CV RISK score.

The hypothesis

Considering all the above things, our new CV RISK (cardiovascular relative individual risk) score is trying to address all these unmet needs. It evaluates using 13 items, the individual relative risk to acquire or to die through CV disease during lifetime.

We included the six RF proved to be important in the INTERHEART study, but we replaced ApoB/ApoA ratio with LDL-C or total cholesterol (TC). We also considered two protective factors: physical activity and a healthy diet. We added HDL-C and TG which can modulate CV risk and also age and gender, heredity and the presence of CV disease [1,2,11,12].

We decided to attribute 1 point of risk to every item, even not present, to reinforce that CV disease can appear even when RF are missing. An exception – no CV disease received 0 points. The protective factors result in percent decrease of calculated risk.

The first seven items are clinical and result in a rough evaluation of CV RISK. When the remaining four laboratory items are available it is possible to more accurately calculate the total CV RISK.

Attributing points of risk to every item we considered the current literature data [1,2], especially INTERHEART study [8] and not our own studies.

Because every factor is evaluated by subjects or patients themselves, and not by a doctor, the evaluation being partially subjective, we simplified the calculation of the points of risk and the percent reduction of CV risk through protective factors. We made it easier to calculate and more motivating for the subjects. We considered this is not an important error because CV RISK doesn’t compare everyone with the others, but with himself, over time.

We will describe separately every item (Table 1).

Age and gender

CV disease is prevalent in men up to 65 years of age, and in women above 75 [1,2]. Considering this, but also the low incidence of ischemic heart disease in young people, we used a combined item for gender and age, attributing 1p for men under 40 and women under 50, 2p between 40–65 (men) and 50–75 (women) and 3p above this age (see Table 2).

Heredity

The influence of heredity is difficult to quantify, but genetic component is suggested when CV disease appears under 55 (men) or 65 (women) [13,14]. To simplify, we considered 60 years of age for both genders. If parents didn’t develop CV disease before 60, the value of risk is 1p; if they did, it’s 2p.

Psychosocial stress

It is difficult to define and recognize and usually it is not included in CV risk scores. We think it is important even if subjective, and INTERHEART demonstrated that a too tempestuous lifestyle is a true CV risk factor [15,16]. We ask subjects to appreciate whether they are stressed during daily activity (2p) or not (1p).

| Table 1 |
| CV RISK calculation chart. |
| 1 | Age and gender | < 40 yr (M); < 50 yr (F) | 1p |
| | 40-65 yr (M); 50-75 yr (F) | 2p |
| | > 65 yr (M); > 75 yr (F) | 3p |
| 2 | Heredity | parents without CVD < 60 yr | 1p |
| | parents with CVD < 60 yr | 2p |
| 3 | Smoking (any) | No | 1p |
| | Yes | 2p |
| 4 | BP | < 140/90 mmHg | 1p |
| | ≥ 140/90 mmHg | 2p |
| 5 | Obesity | BMI < 30 Kg/m² | 1p |
| | BMI ≥ 30 Kg/m² | 2p |
| 6 | Stress | No | 1p |
| | Yes | 2p |
| 7 | CVD | Without CVD | 0p |
| | With CVD | 10p |
| 8 | LDL-C (TC) | < 100 mg/dl; (< 175 mg/dl) | 1p |
| | 100–160 mg/dl; (175–250 mg/dl) | 2p |
| | > 160 mg/dl; (> 250 mg/dl) | 3p |
| 9 | HDL | ≥ 40 mg/dl (M); ≥ 54 mg/dl (F) | 1p |
| | < 40 mg/dl (M); < 54 mg/dl (F) | 2p |
| 10 | TG | < 150 mg/dl | 1p |
| | ≥ 150 mg/dl | 2p |
| 11 | DM | No | 1p |
| | Yes | 2p |
| 12 | Physical activity | Yes | –25% |
| 13 | Healthy diet | Yes | –15% |

Abbreviations: BMI, body mass index; BP, blood pressure; CVD, cardiovascular disease; DM, diabetes mellitus; F, female; HDL-C, HDL cholesterol; LDL-C, LDL cholesterol; M, male; TC, total cholesterol; TG, triglycerides;
Clinical CV RISK: items 1–7 (± 12, 13) Total CV RISK: items 1–11 (± 12, 13).

| Table 2 |
| Optimal and maximal CV RISK by age and gender. |
| Category | Optimal CV RISK | Maximal CV RISK |
| | Clinical | Total | Clinical | Total |
| Without CVD | 3.6p | 6p | 11p | 20p |
| | 4.2p | 6.6p | 12p | 21p |
| | 4.8p | 7.2p | 13p | 22p |
| With CVD | 9.6p | 12p | 21p | 30p |
| | 10.2p | 12.6p | 22p | 31p |
| | 10.8p | 13.2p | 23p | 32p |

Abbreviations: CVD, cardiovascular disease; F, female; M, male; CV RISK – a New Relative Cardiovascular Risk Score.

Smoking

Smoking is first among modifiable risk factors [17,18], being easier to be influenced, even if the results at population level are not so good. It is easily detectable but not easily quantified. We accorded 1p for nonsmokers and former smokers and 2p for smokers of any type and...
considered, according to guidelines but simplifying this process, Laboratory data is ischemic heart disease.

RISK, with a rough, but important, estimation of the risk to develop an opportunity for preventive measures and a healthy lifestyle. This way, in time, the patients are motivated to adopt secondary preventive measures and a healthy lifestyle.

All the above 7 items are included in the clinical module-clinical CV RISK, with a rough, but important, estimation of the risk to develop an ischemic heart disease.

Laboratory data

They are very important and included in CV RISK when they are available. LDL-C (or TC) is one of the most important risk factors [22,23], We assigned 10 points for this clinical condition. This will increase substantially the number of points of risk, but an adequate control of RF and promotion of protective factors can much decrease the calculated risk. This way, in time, the patients are motivated to adopt secondary preventive measures and a healthy lifestyle.

Cardiovascular disease

Cardiovascular disease is not included in risk scores, CV patients being considered always and forever as very high-risk category [1]. We assigned 10 points for this clinical condition. This will increase substantially the number of points of risk, but an adequate control of RF and promotion of protective factors can much decrease the calculated risk. This way, in time, the patients are motivated to adopt secondary preventive measures and a healthy lifestyle.

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