Cardiovascular Risk Assessment

See also separate Prevention of Cardiovascular Disease article.

Introduction

Risk assessment tools to estimate the patient’s 10-year risk of developing cardiovascular disease (CVD) should be used to identify high-risk people for primary prevention. The latest National Institute for Health and Care Excellence (NICE) guidance (2010) does not recommend any particular risk calculator. Those calculators which are based on the Framingham risk equation may overestimate risk in UK populations. This may be as much as 5% for UK men.\[1\]

Over the age of 70 years CVD risk is usually greater than 20% over 10 years, especially for men; total CVD risk should still be formally estimated using the charts. However, this will underestimate the true total CVD risk of a person older than 70 years.

How to use the assessment tools

The tools are an aid to making clinical decisions about how intensively to intervene on lifestyle and whether to use antihypertensive and lipid-lowering medication. A patient-centred approach is essential and the risk assessment should be documented in the record.\[2\] Decisions on treatment should be made after full explanation and due note taken of the patient’s needs and preferences.\[2\]

Once all risk factors have been identified, cardiovascular risk charts or calculator should be used to estimate the total risk of developing CVD over the following 10 years. A total CVD risk of over 20% over 10 years is defined as high-risk. People with moderate-to-high risk are more likely to be compliant with lifestyle changes and preventative medication if given information about their individual cardiovascular risk.\[3, 4\]

Who should NOT use them

Formal risk assessment is not necessary for the following people, as they are considered already to be at high enough risk to justify lifestyle and other interventions (antithrombotic, antihypertensive and lipid-lowering therapies).

- Patients with atherosclerotic CVD.
- Hypertension (≥160/100 mm Hg) with target organ damage.
- Patients with type 1 or type 2 diabetes mellitus.
- Renal dysfunction (including diabetic nephropathy).
- Familial hypercholesterolaemia, familial combined hyperlipidaemia or other inherited dyslipidaemia as identified by Simon Broome diagnostic criteria.\[5\]
- People aged 75 or older. They should also be considered at increased risk of CVD, particularly if hypertensive or smokers. They are likely to benefit from statin treatment. Assessment and treatment should be guided by the benefits and risks of treatment, informed preference and comorbidities that may make treatment inappropriate.\[2\]

The QRISK®2 calculator

This calculator was derived from data of a cohort of 1.28 million anonymised UK primary care patients without evidence of diabetes mellitus or CVD. They were followed for 10 years, looking for the first development of CVD as an endpoint.\[6\]

QRISK®2 is the recommended formal risk assessment tool to assess CVD risk for the primary prevention of CVD in people up to and including the age of 84 years. Adults aged 85 years and over and those with existing CVD, type 1 diabetes, chronic kidney disease (CKD) or familial hypercholesterolaemia should be considered to be at an increased risk of CVD events without using QRISK®2.\[7\]

The current version of the calculator (QRISK®2) uses the following parameters (if known - missing values are calculated by a complex averaging procedure called multiple imputation):\[8, 9\]

- Patient age (30-84).
- Patient gender.
- Smoking status (non, ex, light, moderate, heavy).
- Diabetes.
- Angina or heart attack in a first-degree relative < 60 (yes/no).
- Existing treatment with blood pressure agent (yes/no).
- Postcode (postcode-related Townsend score) - a geographical measure of deprivation.
- BMI (height and weight).
- Systolic blood pressure (use current not pre-treatment value).
- Total and HDL cholesterol.
- Self-assigned ethnicity (should not be confused with nationality).
- Rheumatoid arthritis.
The calculator is available at [http://www.qrisk.org](http://www.qrisk.org).

An advanced calculator is also available at [www.qintervention.org](http://www.qintervention.org) which combines QRISK® with QDScore® (which calculated risk of diabetes) and also enables you to work out how the risk would change with various interventions such as losing weight, better blood pressure control, use of statins and stopping smoking.

**Advantages**
- Works over a wider age range (30-84) instead of 35-74 years which means it better meets QOF requirements.
- Calculated risk is calibrated to the contemporary UK population, so is likely to provide more appropriate risk estimates to help identify high-risk patients.
- Calculated risk is adjusted for additional variables - obesity, social deprivation, ethnicity, rheumatoid arthritis and current treatment with antihypertensives.
- It has been validated in the UK using an alternative research database.\(^{[10]}\)
- It is updated every year to ensure that it takes account of changes in the population (obesity is rising, smoking rates are falling); improvements in data quality (eg, more patients’ ethnicity recorded) and changes in national guidelines and requirements (such as the extended age range now in QOF).

**Disadvantages**
- It is less well established than Framingham. However, QRISK® is now integrated into all major GP computer systems and included in national guidelines.

**Joint British Societies’ Coronary Risk Prediction Chart**

The Joint British Societies’ Coronary Risk Prediction Chart has been used for many years.\(^{[11]}\) The Joint British Societies’ (JBS3) risk calculator can be used to estimate both 10-year risk and lifetime risk of CVD in all individuals except for those with existing CVD or certain high-risk diseases, ie diabetes age >40 years, patients with CKD stages 3-5, or familial hypercholesterolaemia.\(^{[12]}\)

The use of these charts is not appropriate for patients with established CVD, familial hypercholesterolaemia or other inherited dyslipidaemias, chronic renal dysfunction or type 1 or 2 diabetes mellitus.
Method
- To estimate an individual's absolute 10-year risk of developing CVD, choose the table for his or her gender, glucose level (normal or impaired), smoking status (smoker/non-smoker) and age.
- Within this square, define the level of risk according to the point where the co-ordinates for systolic blood pressure and the ratio of total cholesterol to HDL cholesterol meet.
- Higher-risk individuals are defined as those whose 10-year coronary heart disease (CHD) risk exceeds 15%, which is equivalent to a combined risk of CHD and stroke (cardiovascular risk) of >20% over the same period.

Patient data required are as follows
The initial blood pressure and the first random (non-fasting) total cholesterol and HDL cholesterol are used to estimate an individual's risk. However, the decision on using drug therapy should generally be based on repeat risk factor measurements over a period of time.

- Gender.
- Age (years).
- Systolic blood pressure (mm Hg).
- Smoking status (yes/no): smoking status should reflect lifetime exposure to tobacco and not simply tobacco use at the time of assessment (eg, those who have given up smoking within five years should be regarded as current smokers for the purposes of the charts).
- Total cholesterol
- HDL cholesterol (if no HDL cholesterol result is available, assume this is 1 mmol/L and the lipid scale can be used for total serum cholesterol alone).

Inaccuracies of the charts
All charts are based on groups of people with untreated levels of blood pressure, total cholesterol and HDL cholesterol. The use of these charts is not appropriate for patients who have existing diseases which already put them at high risk - eg, pre-existing CVD, familial lipid disorders, renal dysfunction or established hypertension or diabetes with associated target organ damage.

As a result, CHD risk is higher than indicated in the charts for:[11]

- Those with a family history of premature CHD (male first-degree relatives aged less than 55 years and female first-degree relatives aged less than 65 years) which increases the risk by a factor of approximately 1.5.
- Those with raised triglyceride levels.
- Women with premature menopause.
- Those who have not yet developed diabetes but have impaired fasting glucose (6.1-6.9 mmol/L).
- As the person approaches the next age category. Risk increases exponentially with age so the risk will be closer to the higher decennium for the last four years of each decade.
- High-risk ethnic groups such as South Asians will have their risk underestimated. This is because the charts have not been validated in these populations. For example, in people originating from the Indian subcontinent it is safest to assume that the CVD risk is higher than predicted from the charts (1.4-1.5 times). ETHRISK® calculator may be more appropriate.
- Inaccuracies in estimating risk may also occur in people already taking antihypertensive treatment. In this group, when considering whether to introduce lipid-lowering medication, the charts can act as a guide but, unless recent pretreatment risk factor values are available, it is generally safest to assume that CVD risk is higher than that predicted by current levels of blood pressure or lipids on treatment.

ETHRISK® calculator
This is a modified version of the Framingham CVD risk assessment tool. It has been designed for UK ethnic groups. It uses the prevalence ratios for CVD for each ethnic group compared to the general population and adjusts for differences in mean risk factor levels and prevalence of smoking between each ethnic group.

The calculator can be applied to people aged 35 to 74 without diabetes or a previous history of CVD.
Other coronary risk prediction tools

There are increasing numbers of alternative risk prediction scores, particularly focused on specific groups - eg, people with diabetes, ethnic populations.

- **ASSIGN**: developed in Scotland and includes an index of deprivation and also family history.[14, 15]
- **Reynolds Risk Score**: provides a greater accuracy for assessment of cardiovascular risk in women.[16]
- **UK Prospective Diabetes Study (UKPDS) Risk Engine for people with type 2 diabetes**: [17]
  - Provides risk estimates and 95% confidence intervals, in individuals with type 2 diabetes not known to have heart disease, for non-fatal and fatal CHD, non-fatal and fatal stroke.
  - These can be calculated for any given duration of type 2 diabetes based on current age, sex, ethnicity, smoking status, presence or absence of atrial fibrillation and levels of HbA1c, systolic blood pressure, total cholesterol and HDL cholesterol.

- **INDANA (INdividual Data ANalysis of Antihypertensive drug intervention)** risk calculator: focuses on patients with raised blood pressure.[18]
- **SCORE tables**: proposed by the European Society of Cardiology.[19]

Further reading & references

2. Lipid modification - cardiovascular risk assessment and the modification of blood lipids for the prevention of primary and secondary cardiovascular disease; NICE Clinical Guideline (July 2014)
5. Identification and management of familial hypercholesterolaemia; NICE Clinical Guideline (August 2008 – last updated July 2016)
7. Cardiovascular risk assessment and lipid modification; NICE Quality Standard, September 2015
8. QRISK®2 - Cardiovascular Risk Assessment Calculator
11. CVD risk assessment and management; NICE CKS, September 2014 (UK access only)
13. The ASSIGN Score
16. UKPDS Risk Engine

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