A cardiovascular risk algorithm for people not under current management

Martin Hadley-Brown, Lorraine Avery, Anthony Barnett, Roger Gadsby, Gwen Hall, Jim McMorran

Healthcare professionals are working towards the time when all people in a primary care setting can be assured of receiving an appropriate model of cardiovascular (CV) risk assessment. With the aim of making progress towards this goal, the authors produced a pragmatic, evidence-based algorithm for assessing and managing CV risk in people not currently under a management strategy. Here they present the algorithm along with a description for each part. Two sets of treatment targets are provided, one for audit and one for best practice.

Article points

1. The authors aimed to produce an algorithm for assessing and managing cardiovascular (CV) risk in people not currently being treated.
2. The main goal was for a pragmatic, evidence-based algorithm that can be used by primary care practitioners with specialist knowledge of CV risk management and, equally, by those without such knowledge.

Key words
- Cardiovascular risk
- Algorithm
- Best practice
- Audit standards

A template for the cardiovascular (CV) risk algorithm is presented in *Figure 1*. Each section in this template is discussed further below. The full algorithm is presented in *Figure 2*.

Input

People who have had a CV risk factor, such as diabetes, or elevated blood pressure identified will already be receiving treatment under the direction of an appropriate clinic. This algorithm, therefore, is for people who have no history of cardiovascular disease (CVD) or diabetes and who are not under current management for any CV risk factor. Among this subset of the population, satisfying one or more of the following readily identifiable criteria should, in our opinion, lead to entry into the screening section of the algorithm.

Criterion 1: Age between 40 or 50 and 80 years

The lower end of the age range will depend on ethnicity. Because of the predisposition to CVD in Black (Ofili et al, 1999) and South Asian people (Barnett et al, 2006), we propose a minimum age of 40 years for these ethnic groups. Black people typically have a higher risk of elevated blood pressure (Ofili et al, 1999), and so it is important to screen for this in adults older than 40-years-old. Similarly, the higher risk of diabetes in South Asian people (Barnett et al, 2006) should be taken into consideration. In

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Page points

1. Our proposed body mass index (BMI) thresholds are dependent on ethnicity. We recommend a BMI threshold of 25 kg/m^2 for Asian people and one of 30 kg/m^2 for all other individuals.
2. CVD is deemed to be premature if it occurs in males aged less than 55 years or females aged less than 65 years. A first-degree relative is a parent, sibling or child.
3. As well as specific cardiovascular risk factors, diet and exercise should also be discussed during a consultation, if possible.

Caucasian people and ethnic groups other than Black and South Asian people, we recommend a minimum age of 50 years. Due to the lack of evidence in people over the age of 75 years we believe that a maximum age of 80 years should be adopted. This is in keeping with the Joint British Societies' guidelines on the prevention of cardiovascular disease in clinical practice (JBS-2; British Cardiac Society et al, 2005).

Criterion 2: Body mass index ≥25 or 30 kg/m^2

Our proposed body mass index (BMI) thresholds are also dependent on ethnicity. The World Health Organization (WHO) defines obesity as a BMI of 30 kg/m^2 or greater for all ethnic groups, but it acknowledges that a given level of CVD risk is seen at lower BMI values in Asian people (WHO, 2006). Hence, we recommend a BMI threshold of 25 kg/m^2 for Asian people and one of 30 kg/m^2 for all other individuals.

Criterion 3: Family history of premature CVD in a first-degree relative

CVD is deemed to be premature if it occurs in males aged less than 55 years or females aged less than 65 years (British Cardiac Society et al, 2005). A first-degree relative is a parent, sibling or child.

Based on the tenet of offering the best possible care using the available healthcare resources, each primary care practice should adopt a pragmatic approach to prioritising those who enter this algorithm. For instance, a particular practice might use a BMI threshold for Caucasian people of 31 kg/m^2 in the first year before reducing the threshold to the standard level in the second year.

Screening

CV risk factors that should be screened for are detailed below. If possible, diet and exercise should also be discussed during a consultation.

Family history

A family history of premature CVD in a first-degree relative, as defined in input criterion 3, is one CV risk factor. This is also in accordance with the JBS-2 guidelines (British Cardiac Society et al, 2005).

Body metrics

Another CV risk factor covered in the input criteria is a raised BMI, with ethnicity-specific thresholds as defined in criterion 2 above. People with a BMI below their threshold, however, may have a body metrics-related risk factor, depending on their waist circumference. For waist circumference, we recommend the thresholds used by the International Diabetes Federation (IDF) in its definition of the metabolic syndrome (IDF, 2005b; *Table 1*).

Blood pressure

For blood pressure, we advise a CV risk threshold of 140/85 mmHg (British Cardiac Society et al, 2005).

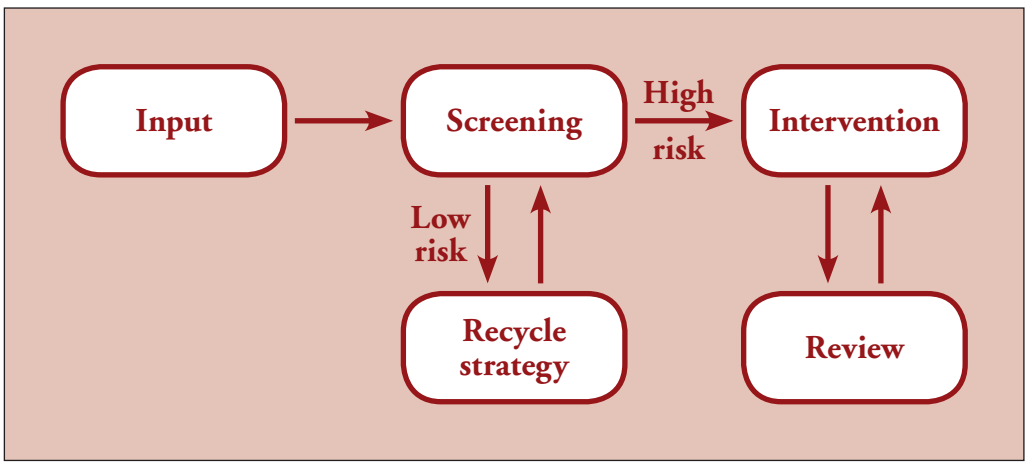


Figure 1. Template for the cardiovascular risk algorithm.

Smoking

We consider any history of smoking to be a CV risk factor (Tsuchiya et al, 2002).

Blood glucose

The diagnosis of impaired fasting glucose or diabetes can be made by a random blood glucose value of ≥6.1 mmol/l as a trigger for a more accurate test (that is, a fasting blood glucose test or an oral glucose tolerance test; British Cardiac Society et al, 2005). Accordingly, we propose a laboratory random blood glucose value of 6.1 mmol/l or greater as a trigger for a fasting blood glucose test. A fasting blood glucose value of 6.1–6.9 mmol/l indicates impaired fasting blood glucose, while a value of 7.0 mmol/l or above in the presence of symptoms (or two samples in the absence of symptoms) corresponds to a diagnosis of diabetes (WHO, 1999); in our opinion, either of these constitutes a significant CV risk factor.

Lipids

To determine if lipid levels represent a CV risk factor in people without diabetes, we recommend calculating the ratio of random total cholesterol to random HDL-cholesterol and seeing if this value yields a CVD risk greater than 20% over the next 10 years using the Joint British Societies' risk charts (British Cardiac Society et al, 2005). In the absence of an HDL-cholesterol figure, assume a value of 1.0 mmol/l for men and a value of 1.2 mmol/l for women (British Cardiac Society et al, 2005).

Because of the predisposition to CVD in certain ethnic groups (such as South Asian people [Barnett et al, 2006]), which is not taken into account in the risk charts, it is important to note that adjustments may be needed. For instance, a value for CVD risk over the next 10 years calculated in a South Asian person should be adjusted by a factor of 1.5 (as extrapolated from Cappuccio and colleagues' data [2002]).

Renal function

As serum creatinine level cut-off points for the assessment of renal function is flawed (it is not adjusted for, for example, age and sex) we propose the use of the estimated glomerular filtration rate (eGFR). This is in keeping with the Renal Association's guidleines (Renal Assosciation, 2006), as are the following cut-off points. We propose an eGFR of 30–60 ml/min as a CV risk factor. Individuals with an eGFR below 30 should be referred to a nephrologist (Renal Association, 2006).

However, it must be noted that eGFR is only an estimate and is likely to be inaccurate in people with, for example, extreme body types, such as the malnourished and amputees (Renal Association, 2006). Further information on when to and not to use eGFR is available on the Renal Association website (2006).

For the purposes of this algorithm, individuals with one or more of the CV risk factors discussed above are deemed to be at high risk of developing CVD and should be entered into the intervention section. Those people without any of the specific risk factors are deemed to be currently at low risk of CVD; they are covered by the recycle strategy. Both of these are discussed in more detail below.

Table 1. International Diabetes Federation (IDF) waist circumference thresholds used in its metabolic syndrome definition (IDF, 2005b).

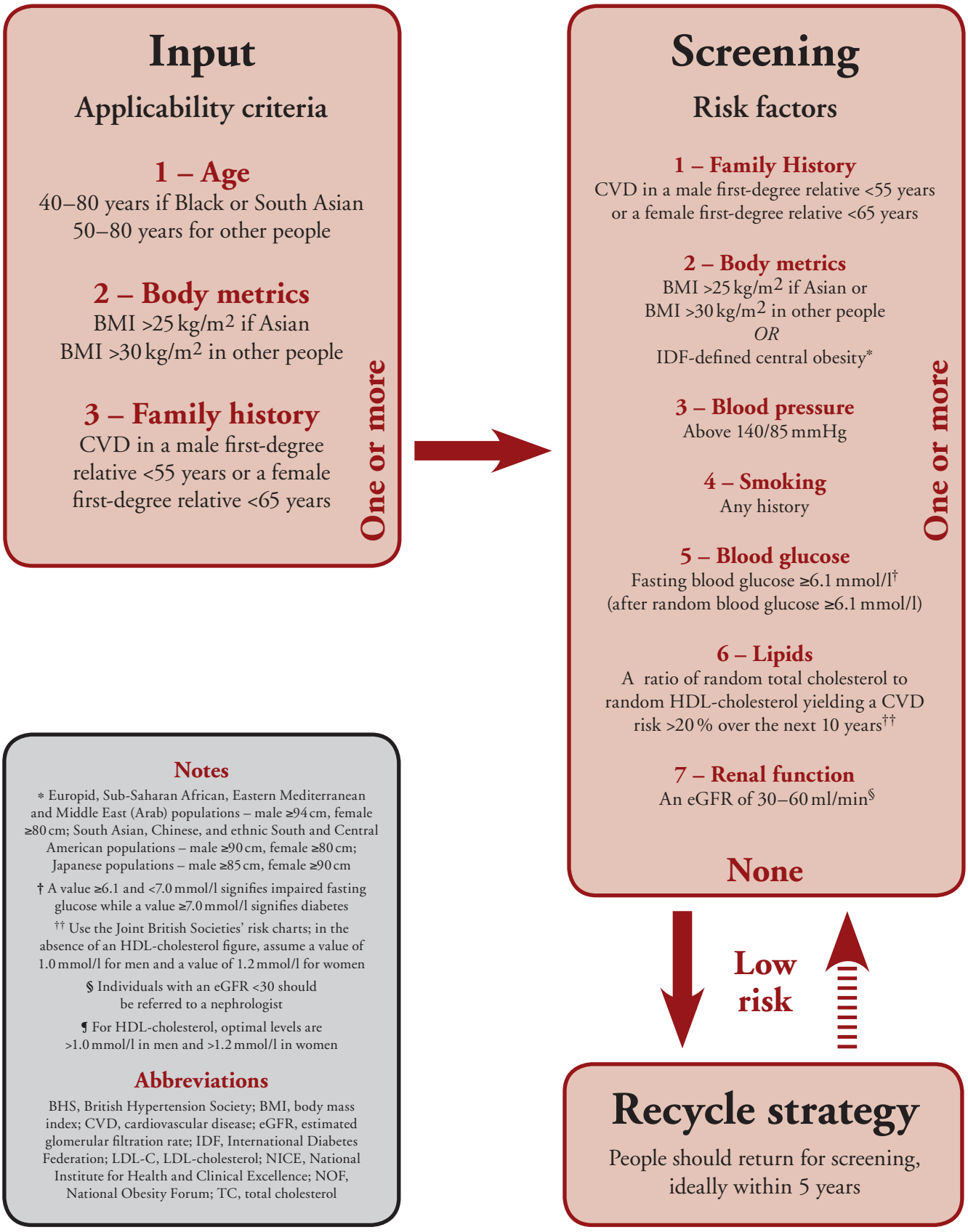
Country/ Ethnic group	Waist circumference (as measure of central obesity)
Europid populations*	Male ≥94 cm Female ≥80 cm
South Asian populations**	Male ≥90 cm Female ≥80 cm
Chinese populations	Male ≥90 cm Female ≥80 cm
Japanese populations***	Male ≥85 cm Female ≥90 cm
Ethnic South and Central American populations	Use South Asian recommendations until more specific data are available
Sub-Saharan African populations	Use European recommendations until more specific data are available
Eastern Mediterranean and Middle East (Arab) populations	Use European recommendations until more specific data are available

* *In the USA, the ATP III values (males, 102 cm; females , 88 cm) are likely to be continued to be used for clinical purposes.*

** *Based upon a Chinese, Malay and Asian Indian population.*

*** *Subsequent data analyses suggest that Asian values (males, 90 cm; females, 80 cm) should be used for Japanese populations until more data are available.*

Figure 2. Cardiovascular risk algorithm.



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Intervention

Risk factor	Guidelines	Target: Best practice	Target: Audit
Body metrics	NOF weight management guidelines www.nationalobesityforum.org.uk/apps/content/html/ViewContent.aspx?id=646	≤25 kgm^2 and ≤23 kgm^2 Caucasians and South Asians, respectively	N/A
Blood pressure	NICE and BHS hypertension clinical guideline www.nice.org.uk/page.aspx?o=CG34 Joint British Societies' guidelines heart.bmjjournals.com (vol 91 page v1)	*In people with diabetes* <130/80 mmHg	<145/85 mmHg
		In people without diabetes <140/85 mmHg	<150/90 mmHg
Smoking	NICE smoking cessation technology appraisal www.nice.org.uk/page.aspx?o=36976	None	None
Blood glucose	NICE clinical guideline on blood glucose www.nice.org.uk/page.aspx?o=GuidelineG	*In people with diabetes* HbA_{1c} <6.5 %	HbA_{1c} <7.5 %
	IDF global guideline for type 2 diabetes www.idf.org/home/index.cfm?node=1457	*In people without diabetes* N/A	N/A
Lipids¶	Joint British Societies' guidelines heart.bmjjournals.com (vol 91 page v1)	TC <4 mmol/l LDL-C <2 mmol/l	TC <5 mmol/l

Review

This should be carried out at an appropriate frequency

Key

Decision

Time delay

Page points

1. Those present at the meeting recommended guidelines for intervention for a number of cardiovascular disease risk factors.
2. These included body metrics, blood pressure, smoking status, blood glucose and lipid levels.
3. They also recommended targets for best practice for these same risk factors.

Recycle strategy

Anyone not entering the intervention section of the algorithm should return for screening, ideally within 5 years (British Cardiac Society et al, 2005).

Intervention

Guidelines for intervention

Various guidance covers the management of modifiable CV risk factors. Below we recommend guidance for each risk factor screened for, except family history (which is not modifiable) and renal function. *Table 2* provides details of where the documents guiding the intervention can be found (the circled numbers in the table correspond to the superscripted circled numbers in the text).

Body metrics

In Caucasian populations a BMI of ≥25 kgm^2 indicates overweight and a BMI of ≥30 kgm^2 indicates clinical obesity (National Obesity Forum, 2006❶). These BMI cut-offs are reduced in South Asian people to ≥23 kgm^2 and ≥27 kgm^2, respectively. It is likely that the NICE guidelines on obesity (due for publication in December 2006 [not published at the time of going to press]) will provide BMI cut-offs to define overweight and obesity for a number of different ethnic groups.

Table 2. Where to obtain documents guiding intervention (numbers relate to guidance mentioned in the text; all accessed 12.09.2006).

No	Document	Where to find it
❶	NOF weight management guidelines	www.nationalobesityforum.org.uk/apps/content/html/ViewContent.aspx?id=6468
❷	NICE and BHS hypertension clinical guideline	www.nice.org.uk/page.aspx?o=CG34
❸	Joint British Societies' guidelines	heart.bmjjournals.com (vol 91 page v1)
❹	NICE smoking cessation technology appraisal	www.nice.org.uk/page.aspx?o=36976
❺	NICE clinical guideline on blood glucose	www.nice.org.uk/page.aspx?o=GuidelineG
❻	IDF global guideline for type 2 diabetes	www.idf.org/home/index.cfm?node=1457
❼	Joint British Societies' guidelines	heart.bmjjournals.com (vol 91 page v1)

BHS, British Hypertension Society; IDF, International Diabetes Federation; NICE, National Institute for Health and Clinical Excellence; NOF, National Obesity Forum

Blood pressure

The British Hypertension Society and NICE have recently published joint guidelines (National Collaborating Centre for Chronic Conditions, 2006) that align their recommendations for blood pressure management❷. This area is also covered in the Joint British Societies' guidelines❸ (British Cardiac Society et al, 2005).

Smoking

NICE has produced a technology appraisal for smoking cessation❹ (NICE, 2002b).

Blood glucose

National guidance on blood glucose management is provided by NICE❺ (NICE, 2002a), but this was published back in 2002 (a revised version is expected in February 2008) and thus misses recent developments. Therefore, the IDF's global guideline on this subject❻ (IDF, 2005a) can be considered. Also, it is important to be aware of any existing local blood glucose guidelines.

Lipids

For lipid management, we recommend the use of statins as per the JBS-2 guidelines❼ (British Cardiac Society et al, 2005).

Targets for intervention

Below we offer treatment targets for best practice. The algorithm also includes audit targets, based on the Quality and Outcomes Framework (QOF) indicators of the new General Medical Services contract (British Medical Association, 2006; *Figure 2*). There is no audit target for body metrics presented in the algorithm because it is only the production of an obesity register that is currently covered by the QOF.

Body metrics

The target should be normal body metrics for an individual's ethnic group.

Blood pressure

In keeping with the JBS-2 guidelines, we recommend that blood pressure should be

under 140/85 mmHg in people without diabetes and under 130/80 mmHg in people with diabetes (British Cardiac Society et al, 2005).

Smoking

Owing to its known risks, the target should, in our opinion, always be smoking cessation.

Blood glucose

This only applies to people diagnosed with diabetes. For this population, current best practice is considered to be an HbA_{1c} less than 6.5 % (British Cardiac Society et al, 2005), and we concur with this.

Lipids

For best practice in lipid management, we recommend that total cholesterol levels should be lower than 4 mmol/l and LDL-cholesterol levels less than 2 mmol/l (British Cardiac Society et al, 2005), although there is some concern about the global applicability of these targets. For HDL-cholesterol, it should be noted that optimal levels are above 1.0 mmol/l in men and above 1.2 mmol/l in women (British Cardiac Society et al, 2005).

Review

Reviews should be carried out at an appropriate frequency with the aim of optimising all of the above risk factor parameters.

Concluding remarks

The algorithm presented here is, by necessity, based on present guidelines and evidence, as well as currently approved treatments. The optimal approach to managing CV risk will change as guidelines are updated and the body of scientific evidence is amended and added to. For instance, updated NICE guidance on blood glucose is expected in February 2008, which will lead to changes in the management of this risk factor. In addition, as new treatments are approved, the options for managing CV risk will grow, with the ultimate aim of reducing the incidence of CVD and its impact on healthcare resources. ■

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British Medical Association (BMA; 2006) *Revisions to the GMS contract, 2006/07*. BMA, London. http://www.bma.org.uk/ap.nsf/Content/revisionnGMSFeb20062 (accessed 12.09.2006)

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International Diabetes Federation (IDF; 2005b) *The IDF consensus worldwide definition of the metabolic syndrome*. IDF, Brussels

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