

## CME Article

# Ministry of Health Clinical Practice Guidelines: Screening of Cardiovascular Disease and Risk Factors

Goh L G, Chua T, Kang V, Kwong K H, Lim W Y, Low L P, Pereira J, Venketasubramanian N, Sethi S K, Sum C F, Tan C L B, Tan H K, Tan S M J, Wong T K M

## ABSTRACT

The Ministry of Health (MOH) publishes clinical practice guidelines on Screening of Cardiovascular Disease and Risk Factors to provide doctors and patients in Singapore with evidence-based guidance on the screening of cardiovascular disease and risk factors. This article reproduces the introduction and executive summary (with recommendations from the guidelines) from the MOH clinical practice guidelines on Screening of Cardiovascular Disease and Risk Factors, for the information of readers of the Singapore Medical Journal. Page numbers mentioned in the reproduced extract refer to the full text of the guidelines, which are available from the Ministry of Health website (<http://www.moh.gov.sg/mohcorp/publications.aspx?id=25776>). The recommendations should be used with reference to the full text of the guidelines. Following this article are multiple choice questions based on the full text of the guidelines.

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## INTRODUCTION

Recommendations on screening for dyslipidaemia, hypertension, diabetes mellitus and obesity published in the 2003 edition of the MOH clinical practice guideline on health screening are updated in this guideline. Related topics on screening for cardiovascular disease, namely the emerging cardiovascular risk factors, pre-participation screening for exercise, asymptomatic cardiovascular disease in diabetes mellitus and chronic renal disease, as well as screening for abdominal aortic aneurysm, peripheral artery disease, cerebrovascular disease and atrial fibrillation are also included. See Appendix 1A and 1B of the full text regarding the accuracy and cost considerations, respectively, in deciding on the most appropriate screening tools.

The burden of cardiovascular disease in Singapore

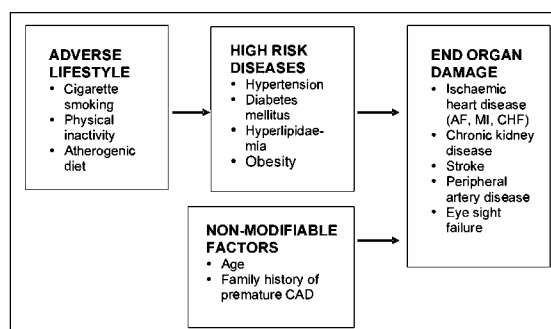


Fig. 1 Major risk factors for cardiovascular disease.

is sizeable. Cardiovascular diseases represent the largest category of diseases for which disability adjusted life-years (DALYs) are lost, accounting for 19.7% of all DALYs lost in Singapore in 2004. Of these, ischaemic heart disease (IHD) and stroke contributed to 10.2% and 7.1% of the DALYs lost, respectively. Coronary artery disease (CAD) and cerebrovascular disease contributed to 20.1% and 8.3% of all deaths, respectively in 2008. These two conditions accounted for 3.5% and 2.1% of all hospital discharges in that year.

Risk of cardiovascular disease is a continuum that begins with the presence of lifestyle-related and inborn cardiovascular risk factors, and progresses through vascular disease caused by these risk factors on to target organ damage and end-organ failure (cardiac, brain, kidney, eye and peripheral vascular disease), and death.

Appropriate screening for modifiable cardiovascular lifestyle risk factors and high risk diseases provide the information for timely intervention to disrupt the progression from risk to disease burden (Fig. 1). Lifestyle change and where necessary, early treatment of high risk diseases combined with therapeutic lifestyle changes will reduce end organ damage.

The contribution of the various risk factors for cardiovascular disease are revealed in the INTERHEART study, a large standardised case-controlled study of acute

Changi Clinic  
Changi General Hospital  
College of Family Physicians Singapore  
Khoo Teck Puat Hospital  
Low Cardiology Clinic  
Ministry of Health National University Health System  
National University Hospital  
People's Association  
Princeton Family Clinic and Princeton Dental Surgery  
Singapore General Hospital  
Singapore Heart Foundation  
(Institutions listed in alphabetical order)

MOH Clinical Practice Guidelines Workgroup on Screening of Cardiovascular Disease and Risk Factors

**Correspondence to:**  
Prof Goh Lee Gan  
Tel: (65) 6223 0606  
Fax: (65) 6222 0204  
Email: cofgohlg@nus.edu.sg

myocardial infarction in 52 low- and middle-income countries. Important harmful factors (increase risk) that influence the risk of acute myocardial infarction in decreasing order are: dyslipidaemia, smoking, diabetes mellitus, hypertension and abdominal obesity. The important protective factors (decrease risk) are daily fruit and vegetable consumption, and regular physical exercise (Table I).

Single high risk factors are important in preventing cardiovascular disease, but the combined effect of many moderately high risk factors may be just as destructive as a single high risk factor; hence, the need for a global risk assessment.

**Table 1. Factors that influence the risk of acute myocardial infarction.**

| Risk factor                              | Odds ratio (95% CI) |
|--|---------------------|
| <b>Harmful (increase risk)</b>           |                     |
| Dyslipidaemia (highest vs lowest decile) | 3.25(2.81–3.76)     |
| Smoking (current vs. never)              | 2.87(2.58–3.19)     |
| Diabetes                                 | 2.37(2.07–2.71)     |
| Hypertension                             | 1.91(1.74–2.10)     |
| Abdominal obesity (highest vs. lowest)   | 1.62(1.45–1.80)     |
| <b>Protective (decrease risk)</b>        |                     |
| Daily fruit and vegetable consumption    | 0.70 (0.62–0.70)    |
| Regular physical exercise                | 0.86(0.76–0.97)     |

Source: Yusuf et al, 2004, the INTERHEART study.

For global assessment of cardiovascular risk, the Framingham risk score is the prototype risk scoring system. A comprehensive assessment of risk factors is recommended by the American Heart Association to be performed at least every five years starting at 18 years of age. Those with increased cardiovascular risk, for example, those with diabetes mellitus, cigarette smokers or those with obesity, should have their risk factors and cardiovascular risk assessed more frequently.

The Framingham risk score has been modified locally, taking into account the Singapore cardiovascular epidemiological data. This modification was carried out as part of a collaboration between investigators at the Singapore Ministry of Health, Singapore General Hospital, National University of Singapore and Prof Ralph B D'Agostino from the Framingham Heart Study, USA.

Based on the Framingham risk score, the individual is classified as low, intermediate or high risk for cardiovascular disease corresponding respectively to a < 10%, 10%–20% and > 20% risk of vascular events over a ten-year period, including non-fatal myocardial infarction or cardiac death.

For individuals at intermediate risk, the ability of emerging risk factors for coronary artery disease in further stratifying patients into high risk category have been evaluated by the United States Preventive Services Task Force, but none of the following have

been shown conclusively to be suitable for routine use: (1) high-sensitivity C-reactive protein; (2) ankle-brachial index; (3) leucocyte count; (4) fasting blood glucose; (5) periodontal disease; (6) carotid intima-media thickness; (7) coronary artery calcium score on electron-beam computed tomography; (8) homocysteine level; and (9) lipoprotein(a) level.

Finally, whilst the focus of this CPG is on screening for cardiovascular disease and risk factors, it is important to emphasise that the purpose of screening is to enable lifestyle interventions to be undertaken to reduce the burden of cardiovascular disease.

The recommendations in this CPG have also been categorised using the AMS-MOH Screening categories. Please see Appendix 4 of the full text.

## REVIEW OF GUIDELINES

Evidence-based clinical practice guidelines are by nature constantly evolving. New, emerging evidence could always supersede these guidelines, and users need to be aware of this. The workgroup advises that these guidelines be scheduled for review three years after publication, or if it is felt that new evidence is available that would require substantive amendments to the current set of guidelines.

## EXECUTIVE SUMMARY OF RECOMMENDATIONS

This Executive Summary lists the recommendations in this CPG on the screening of cardiovascular disease and risk factors. Details of the recommendations listed can be found in the main text as indicated by the pages.

### Screening for cardiovascular risk factors

**B** All patients should be asked if they use tobacco and their smoking status should be documented on a regular basis (pg 14).

**Grade B, Level 2+**

**B** Consistent update of smoking cessation status of every tobacco user is recommended at each clinical consultation (pg 15).

**Grade B, Level 2+**

**D** All patients aged 18 and older should be asked if they are participating in any physical activity, and if so, the level, intensity and duration of such activity (pg 15).

**Grade D, Level 4**

**D** It is recommended that each individual be screened for adherence to the Singapore Health Promotion

Board's guidelines for healthy eating (pg 16).

**Grade D, Level 4**

**C** It is recommended that screening for obesity be done for individuals 18 years and older annually. The height, weight and waist circumference should be measured, and the body mass index calculated (pg 16).

**Grade C, Level 2+**

**B** It is strongly recommended that clinicians routinely screen men and women aged 40 years and older for lipid disorders (pg 18).

**Grade B, Level 2++**

**GPP** It is recommended that clinicians routinely screen younger adults (men and women aged 18 years and older) for lipid disorders if they have other risk factors for coronary artery disease (pg 18).

**GPP**

**GPP** It is recommended that clinicians review patients' lipid levels at regular levels depending on the risk categories and whether on lipid modifying drug therapy (pg 19).

**GPP**

**D** Periodic screening for hypertension is recommended for all adults aged 18 years or older. Blood pressure (BP) should be measured at least once every two years for individuals with diastolic pressure below 80 mmHg and systolic pressure below 130 mmHg (i.e. normal blood pressure). Measurements are recommended annually for persons with a diastolic blood of 80–89 mmHg or systolic blood pressure of 130–139 mmHg (i.e. high normal blood pressure). Persons with higher blood pressure or a major coronary risk factor such as diabetes mellitus require more frequent measurements (pg 19).

**Grade D, Level 4**

**D** The following procedures are recommended when recording BP:

- Allow the patient to sit or lie down for several minutes before measuring the BP.
- The patient should refrain from smoking or ingesting caffeine during the 30 minutes preceding the measurement.
- Use a cuff with a bladder that is 12–13 cm × 35 cm in size, with a larger bladder for fat arms. The bladder within the cuff should encircle at least 80% of the arm.

- Use the disappearance of phase V Korotkoff sound to measure the diastolic BP.
- Measure the BP in both arms at the first visit.
- Take two or more readings separated by two minutes. Average these two values. If the first two readings differ by more than 5 mmHg, additional readings should be obtained and averaged.
- Measure the BP in both the standing and supine positions for elderly subjects and diabetic patients.
- Place the sphygmomanometer cuff at the heart level, whatever the position of the patient (pg 19).

**Grade D, Level 4**

**D** Screening of asymptomatic individuals for type 2 diabetes mellitus should be carried out on an opportunistic basis. Testing should be considered in adults of any age who have one or more risk factors for diabetes mellitus. In those without risk factors, testing should begin at 40 years (pg 21).

**Grade D, Level 4**

**D** When screening for diabetes mellitus, fasting plasma glucose should be used. If the blood cannot be processed within 60 minutes, the blood should be placed in a tube containing sodium fluoride (pg 21).

**Grade D, Level 3**

**B** In patients with typical symptoms, diabetes mellitus can be diagnosed if any one of the following is present:

- Casual<sup>b,c</sup> plasma glucose > 11.1 mmol/L
  - Fasting<sup>d,e</sup> plasma glucose > 7.0 mmol/L
  - 2h plasma glucose during oral > 11.1 mmol/L glucose tolerance test<sup>f</sup>
- a. Where the diagnostic criterion is met in the absence of typical symptoms, a second confirmatory test should be performed on another day.
  - b. Casual is defined as any time of day without regard to interval since last meal.
  - c. Fasting is defined as no caloric intake for at least eight hours.
  - d. Fasting plasma glucose is the more convenient screening test when compared to the glucose tolerance test.
  - e. Subjects with fasting glucose from 6.1–6.9 mmol/L should undergo an oral glucose tolerance test.
  - f. 75 g oral glucose tolerance test should be performed according to WHO recommendations (pg 22).

**Grade B, Level 2++**

**GPP** It is recommended that HbA1c not be used as a screening and diagnostic tool for diabetes mellitus

until its performance in our multi-ethnic population has been evaluated (pg 22).

#### GPP

#### Screening for asymptomatic coronary artery disease

**C** In asymptomatic individuals, it is recommended that the risk of cardiovascular disease first be estimated based on the global assessment of risk factors (pg 26).

**Grade C, Level 2+**

**D** The Framingham Risk Score adapted to the Singapore population should be used to give an estimate of an individual's risk of major coronary artery disease events (pg 27).

**Grade D, Level 4**

**A** People with diabetes mellitus should no longer be automatically assigned to the high risk category for cardiovascular risk. They should therefore be based on appropriate patients' coronary artery disease risk estimates (pg 27).

**Grade A, Level 1++**

**C** In low risk individuals (< 10% ten-year risk of coronary artery disease), further testing for coronary artery disease is not routinely recommended (pg 28).

**Grade C, Level 2++**

**C** There is insufficient evidence to recommend for or against routine screening for coronary artery disease in asymptomatic individuals with intermediate (10%–20% ten-year risk of coronary artery disease) or high risk (> 20% ten-year risk of coronary artery disease). Given the lack of evidence, in intermediate and high risk asymptomatic individuals, further screening should be limited to the following selected situations:

- The exercise treadmill test (exercise treadmill testing) may be performed to: evaluate those with multiple risk factors as a guide to risk-reduction therapy; evaluate asymptomatic men older than 45 years of age and women older than 55 years of age who plan to start vigorous exercise, are involved in occupations in which impairment might impact public safety, or are at high risk for coronary artery disease because of other diseases; evaluate asymptomatic persons with diabetes mellitus who plan to start vigorous exercise.
- The coronary calcium score (CACS) on electron-beam computed tomography may be used in the intermediate coronary artery disease risk patient to decide if the patient should be reclassified to a

higher risk status based on a high CACS. (pg 29)

**Grade C, Level 2++**

**B** The routine use of the resting ECG for screening for coronary artery disease in asymptomatic individuals is not recommended (pg 29).

**Grade B, Level 2++**

**B** Routine use of the exercise treadmill testing to screen for coronary artery disease in asymptomatic low-to-moderate risk individuals is not recommended. Its use among those in the highest risk group (ten-year predicted coronary artery disease risk of 20%) may be considered (pg 30).

**Grade B, Level 2++**

**D** Cardiac stress imaging is not recommended for routine screening for coronary artery disease in asymptomatic patients at low risk (pg 31).

**Grade D, Level 4**

**D** Cardiac stress imaging or stress echocardiography may be considered in a patient who has moderate to high risk of coronary artery disease and abnormal exercise ECG (pg 32).

**Grade D, Level 4**

**D** Stress imaging is not useful for patients with no clinical risk factors who are undergoing intermediate-risk non-cardiac surgery. Such testing is also not useful for asymptomatic patients undergoing low-risk non-cardiac surgery (pg 33).

**Grade D, Level 4**

**D** Cardiac stress imaging may be considered as a preoperative screening in asymptomatic individuals prior to non-cardiac surgery whose: (a) functional status is poor (less than 4 Mets) or unknown; (b) undergoing vascular surgery or intermediate risk surgery (intra-peritoneal and intra-thoracic surgery, carotid endarterectomy, head and neck surgery, orthopaedic surgery, prostate surgery); with (c) one or more risk factors (history of heart disease, history of compensated or prior heart failure, history of cerebrovascular disease, diabetes mellitus, or renal insufficiency); and (d) in whom the results of testing will change management (pg 34).

**Grade D, Level 4**

**D** The use of CACS by means of computerised tomography may be considered in selected situations, namely:

- Asymptomatic patients with intermediate coronary artery disease risk (10%–20% ten-year risk of estimated coronary events, based on the possibility that such patients might be reclassified to a higher risk status based on high CACS, and subsequent patient management may be modified).
- Patients who have atypical cardiac symptoms but otherwise considered to be at low risk of coronary disease, who may benefit from CACS to help in ruling out the presence of obstructive coronary disease (pg 34).

**Grade D, Level 4**

- D** Use of CT coronary angiography as a screening test in low and intermediate risk asymptomatic persons is not recommended (pg 36).

**Grade D, Level 4**

- C** Carotid intima-media thickness measurement is not recommended for routine CVD screening (pg 37).

**Grade C, Level 2+**

- D** It is recommended that the ankle brachial index (ABI) be considered as a screening test for individuals with high risk for peripheral vascular disease, namely

- Age less than 50 years, with diabetes mellitus and one other atherosclerosis risk factor (smoking, dyslipidaemia, or hypertension).
- Age 50–69 years and history of smoking or diabetes mellitus.
- Age 70 years and older (pg 39).

**Grade D, Level 4**

- B** The ankle brachial index may be considered for the purpose of reclassification of an individual who has intermediate risk of coronary artery disease (pg 39).

**Grade B, Level 2+**

#### Biochemical tests in cardiovascular screening

- GPP** For lipid screening, it is recommended that testing be carried out on a venous sample sent for laboratory analysis and not from a finger-prick capillary sample tested in a physician's office or using a bedside testing device (pg 41).

**GPP**

- B** For lipid screening, it is recommended that a fasting venous sample should be collected for lipid levels of total cholesterol, triglycerides, high density lipoprotein cholesterol (HDL-C). Low density lipoprotein

cholesterol (LDL-C) can be reported as a calculated value or as a directly measured result (pg 41).

**Grade B, Level 2++**

- B** Lipoprotein(a) determination is not recommended for routine cardiovascular screening (pg 42).

**Grade B, Level 2++**

- C** Further to a global cardiovascular risk assessment, lipoprotein(a) measurements may be useful in individuals with a strong family history of premature cardiovascular disease (pg 43).

**Grade C, Level 2+**

- D** Routine apolipoprotein B determination is not recommended (pg 43).

**Grade D, Level 4**

- C** It is recommended that caution be exercised in the application of high sensitivity C-reactive protein as a screening test, as risk prediction is not established in Asians and in the elderly (pg 43).

**Grade C, Level 2+**

- B** The measurement of high sensitivity C-reactive protein is recommended only if the ten-year predicted risk based on standard global risk assessment is 5% or more (pg 44).

**Grade B, Level 2+**

- GPP** If the high sensitivity CRP concentration is < 3 mg/L, it does not need to be repeated. If the value is > 3 mg/L, repeat the measurement at least two weeks later, with the patient in a stable state and free of infection or acute illness. Select the lower of the two results as the patient's value (pg 44).

**GPP**

- GPP** Plasma homocysteine measurement is not recommended in cardiovascular screening (pg 44).

**GPP**

- B** Fibrinogen measurement is not recommended for cardiovascular disease screening (pg 45).

**Grade B, Level 2++**

- B** Natriuretic peptides (BNP and NT-proBNP) measurement is not recommended for cardiovascular disease screening (pg 45).

**Grade B, Level 2++**

**Screening for asymptomatic cardiovascular disease in diabetes mellitus and chronic renal disease**

**D** Global cardiovascular assessment is recommended for all patients with diabetes mellitus (pg 46).

**Grade D, Level 4**

**D** It is recommended that the assessment of cardiovascular risk in persons with type 2 diabetes mellitus include a medical history, physical examination, blood pressure, fasting serum lipids, assessment of urine for microalbuminuria or proteinuria and a resting ECG at baseline (pg 47).

**Grade D, Level 4**

**D** For asymptomatic individuals with diabetes mellitus above 40 years of age and intending to engage in more than low intensity exercise, a pre-exercise evaluation and a graded exercise stress ECG are recommended (pg 48).

**Grade D, Level 4**

**D** In patients at risk of chronic kidney disease, screening for risk factors for cardiovascular disease and for coronary artery disease is recommended at baseline and when patients become symptomatic of renal disease (pg 49).

**Grade D, Level 4**

**D** Since the single most important determinant of cardiovascular disease burden is the severity of chronic kidney disease, screening for the presence and level of renal impairment is recommended (pg 49).

**Grade D, Level 4**

**Screening for abdominal aortic aneurysm, peripheral arterial disease, cerebrovascular disease and atrial fibrillation**

**B** Routine ultrasonographic screening of men 65 years and older for abdominal aortic aneurysm may be considered, particularly in those who have ever smoked (current and former smokers) (pg 52).

**Grade B, Level 2++**

**B** Routine screening for abdominal aortic aneurysm in women is not recommended (pg 52).

**Grade B, Level 2+**

**D** Routine screening for carotid artery stenosis is not recommended (pg 53).

**Grade D, Level 4**

**GPP** Routine screening for cerebrovascular disease by MRI is not recommended (pg 54).

**GPP**

**B** Opportunistic screening for atrial fibrillation should be routinely performed for all patients by examining the rate and rhythm by pulse palpation, followed by ECG if atrial fibrillation is suspected (pg 54).

**Grade B, Level 2++**

**Pre-participation screening for exercise**

**D** Pre-participation screening should be done on risk-stratified groups of athletes (pg 58).

**Grade D, Level 4**

**D** All sports participants and national athletes should preferably undergo an appropriate level of annual pre-participation screening (pg 60).

**Grade D, Level 4**

**D** Sports participants involved in strenuous sporting activities, but at a less competitive level than national athletes, should be encouraged to undergo voluntary pre-participation screening (pg 61).

**Grade D, Level 4**

**D** Participants in sports and recreational activities should be encouraged to complete a self-administered pre-participation screening questionnaire annually, and consult a doctor if the questionnaire indicates it (pg 58).

**Grade D, Level 4**

**D** For pre-participation screening, a two- or more stage screening process is encouraged, where the first stage consists of personal and family history taking and physical examination. Based on the findings of the first stage, further tests such as a resting ECG (if not already done), chest X-ray, exercise stress test, echocardiogram, blood investigations, urine tests may be ordered, if indicated (pg 61).

**Grade D, Level 4**

**GPP** Abbreviated screening protocols are acceptable in the intervening years between the full screening (pg 61).

**GPP**

**SINGAPORE MEDICAL COUNCIL CATEGORY 3B CME PROGRAMME**  
**Multiple Choice Questions (Code SMJ 201103C)**

These questions are based on the full text of the guidelines which may be found at <http://www.moh.gov.sg/mohcorp/publications.aspx?id=25776>.

- |  | True   | False  |
|--|--|--|
| <p><b>Question 1.</b> A 50-year-old man underwent health screening. During the counselling session on his results, he asked about the risk factors for cardiovascular disease. Based on the results from the INTERHEART Study, the most harmful risk factor is:</p> <p>(a) Dyslipidaemia.<br/>           (b) Diabetes mellitus.<br/>           (c) Hypertension.<br/>           (d) Smoking.</p>   | <input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/> | <input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/> |
| <p><b>Question 2.</b> A 35-year-old smoker is being counselled on the results of health screening. He wishes to know what the quantum of risk reduction in mortality that he can expect if he were to quit smoking. Based on the results of a Cochrane review of 20 prospective cohort studies, the percentage risk reduction in mortality is:</p> <p>(a) 16%.<br/>           (b) 26%.<br/>           (c) 36%.<br/>           (d) 56%.</p>   | <input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/> | <input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/> |
| <p><b>Question 3.</b> A 45-year-old woman describes her diet in a health screening questionnaire on dietary habits, as below. They are within the recommendations of the Singapore Health Promotion Board ABCs of healthy eating.</p> <p>(a) Fruits and vegetables: “eating three servings of fruits and one serving of vegetables daily on average”.<br/>           (b) Meat and alternatives: “eating four servings daily”.<br/>           (c) Fats, oils, and salt to flavour food: “variable quantities from day to day”.<br/>           (d) Fluids: “4–5 glasses of water per day”.</p>   | <input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/> | <input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/> |
| <p><b>Question 4.</b> Abdominal obesity is an atherogenic risk factor. The cutoff threshold for women based on the Asia-Pacific consensus is:</p> <p>(a) <math>\geq 78</math> cm.<br/>           (b) <math>\geq 80</math> cm.<br/>           (c) <math>\geq 88</math> cm.<br/>           (d) <math>\geq 90</math> cm.</p>  | <input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/> | <input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/> |
| <p><b>Question 5.</b> The use of glycated haemoglobin (HbA<sub>1c</sub>) has been advocated by the American Diabetes Association as an additional alternative test for screening and diagnosis of diabetes mellitus. With regard to the guideline on cardiovascular disease and risk factors screening in Singapore, which of the recommendations below is/are true?</p> <p>(a) Recommended for screening Caucasians.<br/>           (b) Recommended for screening ethnic Chinese.<br/>           (c) Recommended for screening Asians.<br/>           (d) Not recommended for use as screening or diagnostic test for the time being.</p> | <input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/> | <input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/> |
| <p><b>Question 6.</b> In Framingham Risk Score adapted for Singapore use, the following risk factors are included in the calculation of cardiovascular risk:</p> <p>(a) Diabetes mellitus.<br/>           (b) Smoking.<br/>           (c) LDL-cholesterol level.<br/>           (d) Diastolic blood pressure.</p>  | <input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/> | <input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/> |

**Question 7.** Mr Tan, aged 46, is asymptomatic. From health screening results, he has a blood pressure of 150/100 mmHg, total cholesterol 5.2 mmol/L (200 mg/ml, and HDL 1 mmol/L (40 mg/ml). His eGFR is 55 ml/min. There is no family history of premature cardiovascular disease. He is interested in taking up badminton to keep fit. The following screening tests would be reasonable to consider to further define his cardiovascular risk status:

- |                                       |                          |                          |
|---------------------------------------|--------------------------|--------------------------|
| (a) CT angiography.                   | <input type="checkbox"/> | <input type="checkbox"/> |
| (b) Lp(a) measurement.                | <input type="checkbox"/> | <input type="checkbox"/> |
| (c) Exercise treadmill test.          | <input type="checkbox"/> | <input type="checkbox"/> |
| (d) Natriuretic peptides measurement. | <input type="checkbox"/> | <input type="checkbox"/> |

**Question 8.** A 65-year-old asymptomatic man presents for health screening. He wishes to know if he should be screened for carotid artery stenosis. The following statements are true regarding asymptomatic carotid artery stenosis and silent cerebral infarction:

- |   |                          |                          |
|---|--------------------------|--------------------------|
| (a) Severe stenosis (> 80%) is uncommon in the general Western population (approximately 1%).   | <input type="checkbox"/> | <input type="checkbox"/> |
| (b) Major risk factors for stenosis include advanced age, male gender, hypertension, smoking and hyperlipidaemia.                       | <input type="checkbox"/> | <input type="checkbox"/> |
| (c) The benefit of carotid endarterectomy can be negated by peri-procedural complications.  | <input type="checkbox"/> | <input type="checkbox"/> |
| (d) There is clear evidence that treatment for silent cerebral infarction in the general population reduces the risk of adverse events. | <input type="checkbox"/> | <input type="checkbox"/> |

**Question 9.** In Singapore, the recommendations with regard to pre-participation screening include:

- |  |                          |                          |
|--|--------------------------|--------------------------|
| (a) Selective screening of the at-risk population is recommended.  | <input type="checkbox"/> | <input type="checkbox"/> |
| (b) Pre-participation screening can only be conducted by a sports physician.   | <input type="checkbox"/> | <input type="checkbox"/> |
| (c) The competitive level of the individual is taken into consideration when deciding if pre-participation screening is necessary. | <input type="checkbox"/> | <input type="checkbox"/> |
| (d) All school athletes must undergo compulsory pre-participation screening.   | <input type="checkbox"/> | <input type="checkbox"/> |

**Question 10.** Pre-participation screening for those who participate in physical activity or intend to participate in physical activity:

- |  |                          |                          |
|--|--------------------------|--------------------------|
| (a) Is designed to only detect cardiovascular diseases.                      | <input type="checkbox"/> | <input type="checkbox"/> |
| (b) Is limited only to professional athletes.                                | <input type="checkbox"/> | <input type="checkbox"/> |
| (c) Has been shown to reduce the incidence of sudden cardiac death in Italy. | <input type="checkbox"/> | <input type="checkbox"/> |
| (d) Is unnecessary for those under 35 years of age.                          | <input type="checkbox"/> | <input type="checkbox"/> |

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**Doctor's particulars:**

Name in full: \_\_\_\_\_

MCR number: \_\_\_\_\_ Specialty: \_\_\_\_\_

Email address: \_\_\_\_\_

**SUBMISSION INSTRUCTIONS:**

(1) Log on at the SMJ website: <http://www.sma.org.sg/cme/smj> and select the appropriate set of questions. (2) Select your answers and provide your name, email address and MCR number. Click on "Submit answers" to submit.

**RESULTS:**

(1) Answers will be published in the SMJ May 2011 issue. (2) The MCR numbers of successful candidates will be posted online at [www.sma.org.sg/cme/smj](http://www.sma.org.sg/cme/smj) by 2 May 2011. (3) All online submissions will receive an automatic email acknowledgment. (4) Passing mark is 60%. No mark will be deducted for incorrect answers. (5) The SMJ editorial office will submit the list of successful candidates to the Singapore Medical Council.

**Deadline for submission: (March 2011 SMJ 3B CME programme): 12 noon, 25 April 2011.**