

Clinical factsheet:

The National Heart Foundation of Australia Position Statement on coronary artery calcium scoring for the primary prevention of cardiovascular disease in Australia.

These recommendations for the use of coronary artery calcium scoring are conditional¹.

Following absolute cardiovascular disease risk assessment², only consider coronary artery calcium scoring to reclassify risk for selected patients with **moderate or low risk**.

Absolute cardiovascular disease risk assessment:

Absolute cardiovascular disease risk assessment is recommended for people aged 45 years and over² (or 30 years and over for Aboriginal and Torres Strait Islander peoples³).

Coronary artery calcium scoring is **not necessary** in people already determined to be at **high absolute cardiovascular disease risk** (Box 1), for the purpose of reclassifying risk, as the results are unlikely to change management.

Box.1 Patients clinically determined to be at high risk of cardiovascular disease².

- Diabetes and age > 60 years
- Diabetes with microalbuminuria
- Moderate or severe chronic kidney disease
- Previous diagnosis of familial hypercholesterolaemia
- Systolic blood pressure ≥ 180 mmHg or diastolic blood pressure ≥ 110 mmHg
- Serum total cholesterol > 7.5 mmol/L

Main Recommendations¹:

Coronary artery calcium scoring could be considered for:

- 1** Selected people classified as **moderate absolute cardiovascular disease risk** AND for whom the findings are likely to influence the intensity of risk management.

GRADE Evidence certainty: *Low*. GRADE Recommendation strength: *Conditional*.

- 2** Selected people classified with **low absolute cardiovascular disease risk**, AND who have additional risk-enhancing factors that may result in the underestimation of risk.

GRADE Evidence certainty: *Low*. GRADE Recommendation strength: *Conditional*.

- The absolute cardiovascular disease risk assessment algorithm recommended in the 2012 guidelines² may underestimate risk in certain populations, such as Aboriginal and Torres Strait Islander peoples⁴, or in others with known risk-enhancing factors not fully captured in the algorithm (Box 2).

Box 2. Selected cardiovascular disease 'risk-enhancing' factors from US guidelines⁽⁵⁻⁶⁾.

- Family history of premature atherosclerotic CVD
- Primary hypercholesterolaemia LDL \geq 4.1 mmol/L, non-HDL \geq 4.9 mmol/L
- Persistently elevated triglycerides $>$ 1.98 mmol/L
- Metabolic syndrome
- History of premature menopause
- History of pregnancy-associated conditions that increase later atherosclerotic CVD risk e.g. preeclampsia
- Chronic inflammatory conditions, e.g. rheumatoid arthritis
- High risk ethnicity, e.g. South Asian populations, Aboriginal and Torres Strait Islander peoples
- Other lipids/biomarkers associated with increased atherosclerotic CVD risk, if measured:
 - Elevated high-sensitivity C-reactive protein
 - Elevated lipoprotein (a)
 - Elevated apolipoprotein B
 - Reduced ankle-brachial index ($<$ 0.9)

LDL: low density lipoprotein; non-HDL: non high density lipoprotein

Implications of coronary artery calcium score results

If coronary artery calcium scoring is undertaken:

1. A score = 0 Agatston Units (AU) could reclassify a person to a **low absolute cardiovascular disease risk** status; with subsequent management to be informed by patient/clinician discussion and follow contemporary recommendations for low absolute cardiovascular disease risk.

GRADE Evidence certainty: *Very Low*. GRADE Recommendation strength: *Conditional*.

- Apply caution when reclassifying to a lower risk status in the presence of certain risk-enhancing factors. For example, Aboriginal and Torres Strait Islander peoples, smoking, diabetes, or a family history of cardiovascular disease⁵⁻⁷.
- A score of 0 does not rule out the presence of non-calcified plaque.

2. A score = 1 AU to 99 AU AND $<$ 75th percentile for age and sex (Table 1), reclassification of risk status is uncertain.

3. A score $>$ 99 AU OR \geq 75th percentile for age and sex (Table 1) could reclassify a person to a **high absolute cardiovascular disease risk** status; with subsequent management to be informed by patient/clinician discussion and follow contemporary recommendations for high absolute cardiovascular disease risk.

GRADE Evidence certainty: *Very Low*. GRADE Recommendation strength: *Conditional*.

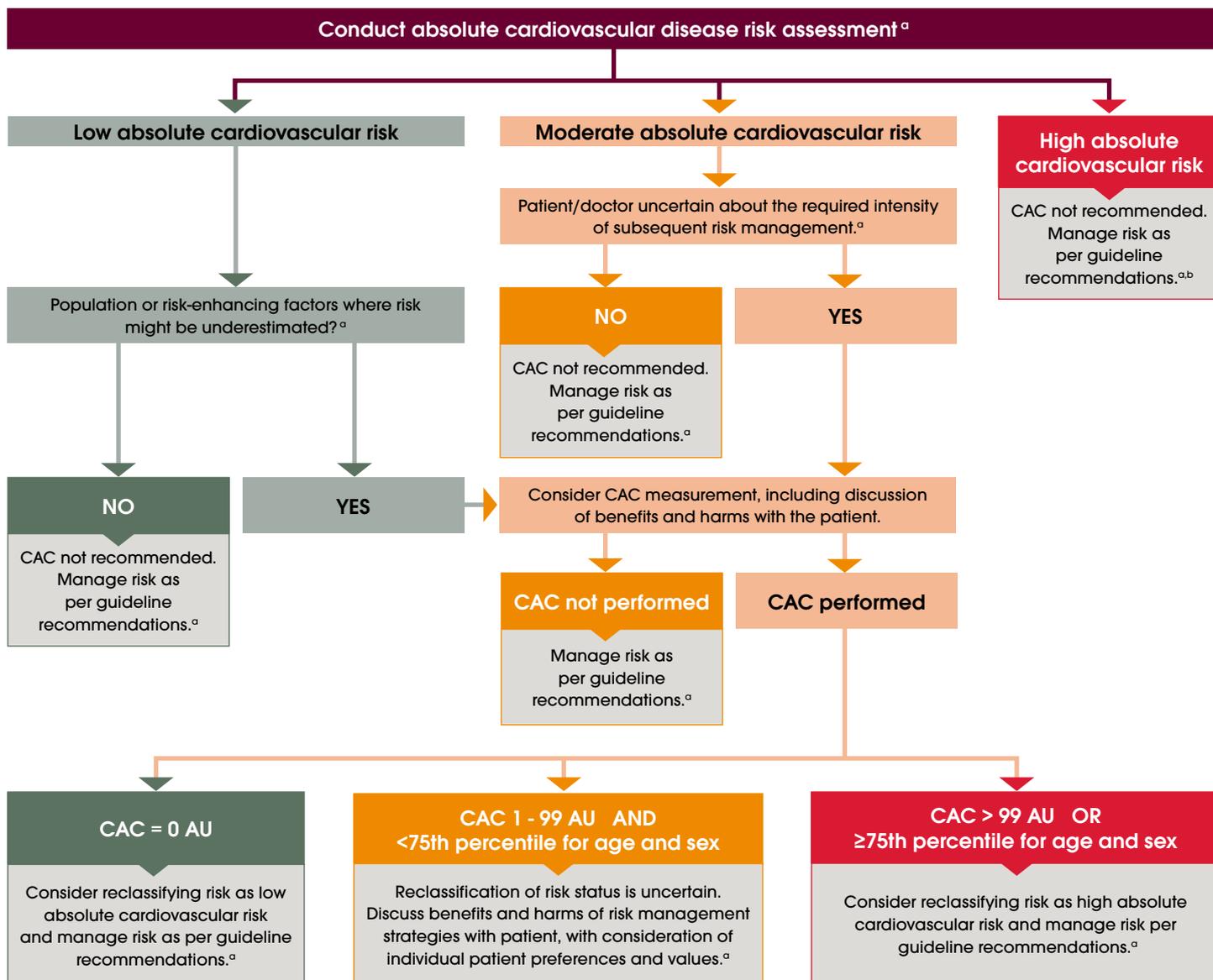
- This result could reclassify a person **indefinitely to high absolute cardiovascular disease risk** status. Repeat calcium scoring is not warranted in this group.

		Men				Women			
		<45	45-54	55-64	65-74	<45	45-54	55-64	65-74
Percentile	Age (yr)								
	25th	0	0	0	40	0	0	0	0
	50th	0	0	30	173	0	0	0	4
	75th	0	21	162	585	0	0	17	43
90th	8	108	315	1230	0	1	91	212	

Table 1: Normal distribution of coronary artery calcium scores (AU) in a healthy cohort stratified by age and sex, adapted from Hoffmann et al.⁸ AU: Agatston units; yr: year.

At the time of publication, coronary artery calcium scoring is not publicly funded in Australia, and the cost lies with individual patients. Please consider the potential impact of cost of coronary artery calcium scoring on health equity using a shared decision-making approach that considers the patient's preferences and values. Where an initial coronary artery calcium score = 0, or ranges from 1 AU to 99 AU AND <75th percentile for age and sex, an interval of five years is reasonable if considering a repeat coronary artery calcium score^{9,10}.

Figure. 1 Integrating conditional recommendations from the National Heart Foundation of Australia's Position Statement on coronary artery calcium scoring for the primary prevention of cardiovascular disease into practice.



Thresholds for coronary artery calcium scoring have been adapted from international guidelines.

a As assessed using the absolute cardiovascular disease risk calculator.

b For the purpose of reclassifying risk. The use of calcium scoring to detect subclinical atherosclerosis may be considered in patients with familial hypercholesterolaemia (FH) in line with guidance from FH Australasia Network¹¹.

AU: Agatston units; CAC: coronary artery calcium.

References

1. Jennings GLR, Audehm R, Bishop W, et al. National Heart Foundation of Australia: position statement on coronary artery calcium scoring for the primary prevention of cardiovascular disease in Australia. *Med J Aust*. Online first 7 May 2021. <https://doi.org/10.5694/mja2.51039>
2. National Vascular Disease Prevention Alliance. Guidelines for the management of absolute cardiovascular disease risk. National Stroke Foundation, 2012. http://www.cvdcheck.org.au/pdf/Absolute_CVD_Risk_Full_Guidelines.pdf
3. Agostino JW, Wong D, Paige E, et al. Cardiovascular disease risk assessment for Aboriginal and Torres Strait Islander adults aged under 35 years: a consensus statement. *Med J Aust*. 2020;212(9):422-427. <https://doi.org/10.5694/mja2.50529>
4. Hua X, McDermott R, Lung T, et al. Validation and recalibration of the Framingham cardiovascular disease risk models in an Australian Indigenous cohort. *Eur J Prev Cardiol*. 2017;24(15):1660-1669. <https://doi.org/10.1177/2047487317722913>
5. Grundy SM, Stone NJ, Bailey AL, et al. 2018 AHA/ACC/AACVPR/AAPA/ABC/ACPM/ADA/AGS/APHA/ASPC/NLA/PCNA Guideline on the Management of Blood Cholesterol: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *Circulation*. 2019;139:e1082–e1143. <https://doi.org/10.1161/CIR.0000000000000625>
6. Arnett DK, Blumenthal RS, Albert MA, et al. 2019 ACC/AHA Guideline on the Primary Prevention of Cardiovascular Disease. A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *Circulation*. 2019;140:e596–e646. <https://doi.org/10.1161/CIR.0000000000000678>
7. Lloyd-Jones DM, Braun LT, Ndumele CE, et al. Use of risk assessment tools to guide decision-making in the primary prevention of atherosclerotic cardiovascular disease. A special report from the American Heart Association and American College of Cardiology. *J Am Coll Cardiol*. 2019;73(24):3153-3167. <https://doi.org/10.1016/j.jacc.2018.11.005>
8. Hoffmann U, Massaro JM, Fox CS, et al. Defining normal distributions of coronary artery calcium in women and men (from the Framingham Heart Study). *Am J Cardiol*. 2008;102(9):1136-1141.e1. <https://doi.org/10.1016/j.amjcard.2008.06.038>
9. Min JK, Lin FY, Gidseg DS, et al. Determinants of coronary calcium conversion among patients with a normal coronary calcium scan: what is the “warranty period” for remaining normal? *J Am Coll Cardiol*. 2010;55(11):1110-1117. <https://doi.org/10.1016/j.jacc.2009.08.088>
10. Alluri K, McEvoy JW, Dardari ZA, et al. Distribution and burden of newly detected coronary artery calcium: Results from the Multi-Ethnic Study of Atherosclerosis. *J Cardiovasc Comput Tomog*. 2015;9(4):337-344.e1. <https://doi.org/10.1016/j.jcct.2015.03.015>
11. Watts GF, Sullivan DR, Hare DL, et al. Integrated guidance for enhancing the care of familial hypercholesterolaemia in Australia. *Heart Lung Circ*. 2021; 30(3):324-349. <https://doi.org/10.1016/j.hlc.2020.09.943>



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